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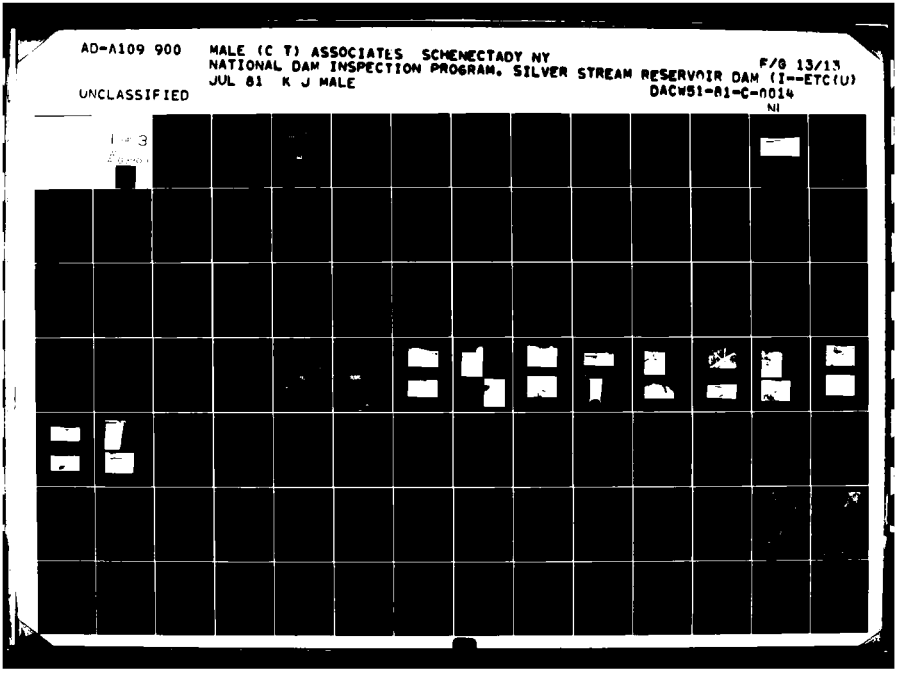

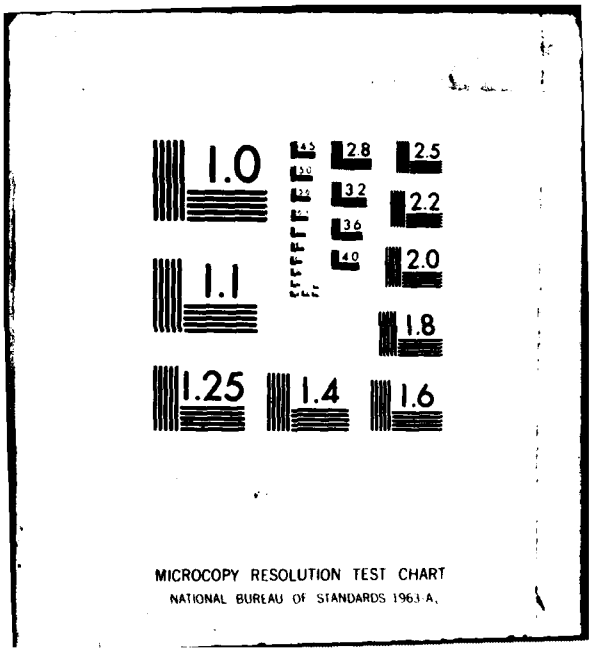
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Silver Stream Reservoir
Lower Hudson River Basin
Orange County

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and visual inspection of the dam did not reveal conditions which constitute an imminent hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial work.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Structural stability analysis of the concrete dike indicates that it is unstable for the winter ice load and 1/2 PMF conditions and that it has unsatisfactory stability for the normal spring-summer-fall condition and the PMF condition. Therefore, it is recommended that a detailed structural stability analysis of the concrete dike under all loading conditions be started within 6 months after receipt of this report by the Owner. Any necessary remedial work should be completed within 18 months after receipt of this report by the Owner. The investigation and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

Hydrologic and hydraulic analysis indicates that the PMF overtops the dike, but not the dam embankment, even when the outlet pipe is fully open. The 1/2 PMF, however, does not overtop the dike, or the dam embankment which is 1.5 feet higher than the dike. Therefore, in accordance with Corps of Engineers screening criteria for review of spillway adequacy, spillway capacity is considered "inadequate", but not seriously inadequate.

LOWER HUDSON RIVER BASIN

TOWN OF NEW WINDSOR

ORANGE COUNTY, NEW YORK

SILVER STREAM RESERVOIR DAM NY 00511

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

DEPARTMENT OF THE ARMY

NEW YORK DISTRICT, CORPS OF ENGINEERS

26 FEDERAL PLAZA

NEW YORK, NY 10278

JULY 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

SILVER STREAM RESERVOIR DAM, NY 00511

PHASE I INSPECTION REPORT

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APPENDICES

TABLES

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.:	NY 00511
Name of Dam:	Silver Stream Reservoir Dam
State Located:	New York
County:	Orange
Municipality:	Town of New Windsor
Watershed:	Lower Hudson River Basin
Stream:	Silver Stream
Date of Inspection:	April 9, 1981

ASSESSMENT

Examination of available documents and visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial work.

Structural stability analysis of the concrete dike indicates that it is unstable for the winter ice load and 1/2 PMF conditions and that it has unsatisfactory stability for the normal spring-summer-fall condition and the PMF condition. Therefore, it is recommended that a detailed structural stability analysis of the concrete dike under all loading conditions be started within 6 months after receipt of this report by the Owner. Any necessary remedial work should be completed within 18 months after receipt of this report by the Owner. The investigation and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

Hydrologic and hydraulic analysis indicates that the PMF overtops the dike, but not the dam embankment, even when the outlet pipe is fully open. The 1/2 PMF, however, does not overtop the dike, or the dam embankment which is 1.5 feet higher than the dike. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "inadequate", but not seriously inadequate.

Because of other deficiencies, the following additional investigations should be started within 6 months after receipt of this report by the Owner. The investigations should be performed by a qualified, registered professional engineer.

1) Inspect for seepage in the outlet pipe and within the areas of ponded water downstream from the dam and dike, including the spillway discharge channel, after those areas have been drained as recommended in Section 7.2a. Establish an appropriate monitoring system if necessary.

2) Inspect the deterioration inside the outlet pipe and determine if the pipe needs to be repaired or replaced.

Any remedial work deemed necessary as a result of these investigations should be completed within 18 months after receipt of this report by the Owner. A qualified, registered professional engineer should design and observe the construction of any necessary remedial work.

The following remedial work should be completed by the Owner within 12 months after his receipt of this report. Where engineering assistance is indicated, the Owner should engage a qualified, registered professional engineer. Assistance by such an engineer may also be useful for some of the other work.

1) Institute a program to visually inspect - not just casually look at - the dam and its appurtenances at least once a month.

2) Remove the brush from the approach channel of the spillway.

3) Drain the ponded water downstream from the dam, dike, and from the spillway and outlet pipe discharge channels so that those areas can be inspected by an engineer. Also, dewater the outlet pipe so that it can be inspected.

4) Repair the right training wall and the floor of the spillway discharge channel in accordance with design and field observation of the work by an engineer.

5) Remove trees, brush, and their root systems from the slopes of the dam and dike embankments and to a distance of 15 feet downstream from their toes in accordance with specifications and field observation of the work by an engineer. Fill resulting holes with properly selected, compacted backfill. Continue to keep these same areas and the crest of the dam and dike embankments clear by cutting, mowing, and cleanup at least annually.

6) Backfill animal holes on the slopes of the dam and dike embankments with properly selected, compacted fill.

7) Contingent on the results of the detailed structural stability analysis of the concrete dike, repair the cracking and deterioration of portions of the dike in accordance with design and field observation of the work by an engineer.

8) Prepare written routine operation and maintenance procedures for the dam, dike, and their appurtenances.

9) Institute a program of comprehensive technical inspection of the dam, dike, and their appurtenances by an engineer on a periodic basis of at least once every two years.

10) Develop an emergency plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system. Also make provisions to open the outlet pipe valve, when necessary, to augment spillway flow during periods of heavy runoff.

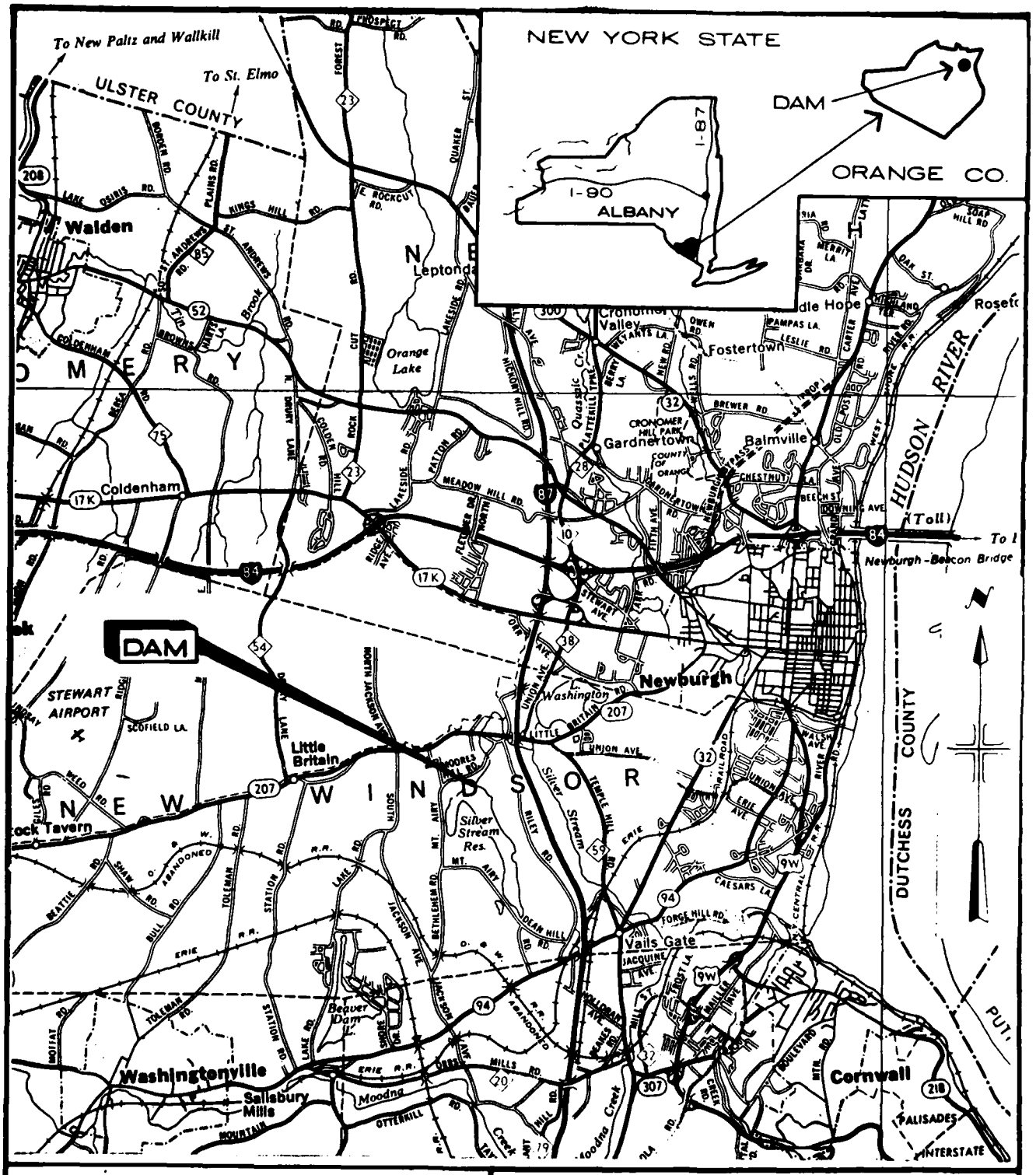
Kenneth J. Male
President
C. T. Male Associates, P.C.
NY PE 25004

Approved by:

Col W. M. Smith, Jr.
New York District Engineer
Corps of Engineers

Date: 14 Sep 81

Overview Photo - Silver Stream Reservoir Dam and Dike. Dam in foreground, dike to right - 4/9/81


NEW YORK STATE
DAM
ORANGE CO.
I-87
I-90
ALBANY
To New Paltz and Wallkill
To St. Elmo
ULSTER COUNTY
Walden
Orange Lake
Coldenham
Leptonda
Cronomer Valley
Fostertown
Gardnertown
Balmville
Newburgh
Newburgh-Beacon Bridge
(Toll)
HUDSON RIVER
DAM
STEWART AIRPORT
Little Britain
NEW WINDSOR
Silver Stream Res.
Vails Gate
Washingtonville
Salisbury Mills
Moodna
Cornwall
DUTCHESS COUNTY
PALISADES INTERSTATE
SCALE OF MILES
0 1 2 3
BASE MAP: ORANGE CO. HIGHWAY MAP - 1973
PROJECT NO. 58.01.010/80.850
SILVER STREAM RESERVOIR DAM
VICINITY MAP
TOWN OF NEW WINDSOR
ORANGE CO., NY
SCALE: 1" = 1.5 MI. APPROX.
DATE: JANUARY 1981
C.T. MALE ASSOCIATES, P.C.
50 TROY ROAD, SCHENECTADY, N.Y. 12305

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

NAME OF DAM: SILVER STREAM RESERVOIR DAM, ID NO. NY 00511

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority

The National Dam Inspection Act, Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New York District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within New York State. C. T. Male Associates, P.C., has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to C. T. Male Associates, P.C., under a letter from Michael A. Jezior, LTC, Corps of Engineers. Contract No. DACW51-81-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purpose of the inspection program is to perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public, and thus permit correction in a timely manner by non-Federal interests.

1.2 DESCRIPTION OF PROJECT

a. Location

The dam is located on Silver Stream about two miles west of the City of Newburgh. The dam at its maximum section is at Latitude 41 degrees - 28.7 minutes North, Longitude 74 degrees - 5.2 minutes west. There is also a large dike on the impoundment, located just to the left of the dam, at Latitude 41 degrees - 28.7 minutes north, Longitude 74 degrees - 5.4 minutes west.

Access to the dam is from State Route 207 (Little Britain Road) to the north as it leads west from the City of Newburgh, then south via Moores Hill Road and a dirt driveway to the left leading to the dam (see Vicinity Map, and Drainage Area Map Appendix C-5).

The official name of the dam is Silver Stream Reservoir Dam and the official name of the impoundment is Silver Stream Reservoir. The popular names of the dam and impoundment are Browns Pond Dam and Browns Pond. The impoundment has also been known as Browns Farm Pond.

b. Description of Dam and Appurtenances

1) Dam

Silver Stream Reservoir Dam is an earth embankment with a single chute spillway. The grass and brush-covered embankment is about 557 feet long (including the chute spillway) by about 22 feet high. The upstream slope is about 2.5H:1V and the downstream slope is about 2H:1V. The upstream slope is covered with hand-placed rock riprap to about 3 feet above the spillway crest. The top width of the dam is about 15 feet.

The dam has a concrete core wall, down to firm material but it does not reach bedrock. The core wall extends up to about 2 feet below the top of dam.

At the left abutment there is an ungated concrete-paved chute spillway. The portion of the spillway at the axis of the dam is crossed by a concrete bridge deck which provides access to the dam crest. The high point of the chute spillway is 5 feet below the top of dam, with a clear opening under the bridge deck of 3.5 feet. The concrete-paved chute discharge channel curves along the left abutment and discharges into the outlet pipe discharge channel located at the center of the dam at the downstream toe.

At about the center of the dam on the upstream side there is a concrete intake structure and control tower with a brick gate house on top, connected to the top of the dam via a service bridge. In the gate house there is a double hand crank bevel geared floor stand for a 48-inch gate valve in the outlet pipe which runs through the bottom of the control tower.

The outlet pipe is a 48-inch cast iron pipe with leaded joints about 104 feet long from the intake headwall to the stone-paved discharge channel at the downstream toe. The discharge channel runs through a concrete box culvert under the Catskill Aqueduct and then into the natural channel of Silver Stream.

2) Dike

About 100 feet to the west or left of the dam, there is a concrete gravity and earth embankment dike separated from the dam by a knoll of natural ground. The concrete gravity section

761 forms the middle of the dike, with earth embankments at either end. The concrete gravity section, which bends downstream in the middle, is about 314 feet long. The earth fill at the left abutment is about 260 feet long while the one at the right abutment is about 121 feet long. The total length of the dike is about 695 feet.

The concrete gravity section extends from about 1.5 feet below the top of dam to as deep as about 6 feet below top of firm material at the concrete cutoff, but does not reach bedrock. The gravity section is about 17 feet high at the downstream toe. The upstream face of this part of the dike is vertical, while the downstream face is nearly vertical for about 12 feet below the top and slopes at about 0.7H:1V for the remainder. The crest of the gravity section is about 5 feet wide.

The grass and brush-covered earth embankment portions of the dike are earth fills with concrete core walls similar to the one in the dam. The earth fills are 15 feet wide at the top and their upstream slopes are covered with hand-placed rock riprap to about 3 feet above the spillway crest. The upstream slopes are about 2.5H:1V and the downstream slopes are about 2H:1V. The earth embankment portions of the dike are about 18 feet high.

c. Size Classification

In accordance with Recommended Guidelines (Reference 1), Silver Stream Reservoir Dam is classified as "intermediate" in size because the maximum storage capacity at top of dam is 2,860 acre-feet and 2,464 acre-feet at top of dike (within the 1,000 to 50,000-acre-foot range). The height of the dam is about 22 feet.

d. Hazard Classification

In accordance with Recommended Guidelines (Reference 1), Silver Stream Reservoir Dam is classified as having a "high" hazard potential. This is because it is judged that failure of the dam would significantly increase flows downstream which could cause loss of more than a few human lives and excessive property damage. Downstream development that could be damaged or destroyed by a dam failure includes: the Catskill Aqueduct, a major raw water transmission main for the New York City Water Supply System, located about 100 feet downstream; a town road (Moores Hill Road) and about 3 dwellings located about 2,000 feet downstream (vertical drop from the dam to these dwellings is about 25 feet); and State Route 207 and about 2 dwellings located about 3,000 feet downstream (vertical drop from the dam to these dwellings is about 35 feet).

e. Ownership

The dam was constructed in 1923 for the present owner:

City of Newburgh
City Hall
83 Broadway
Newburgh, NY 12550

Attention: Gary J. Bloomquist, City Manager
(914) 565-3333

21 f. Operator

Day-to-day operation of the dam is the responsibility of:

James W. Brown, Water Superintendent
Newburgh Water Department
79 Dubois Street
Newburgh, NY 12550

(914) 565-3356

g. Purpose of Dam

The dam was originally constructed to impound water for use as a public water supply for the City of Newburgh. The impoundment is still used for this purpose.

h. Design and Construction History

The dam was constructed in 1923 for the City of Newburgh. The designer was Fuller and Harding Consulting Engineers, 170 Broadway, New York, New York, who are no longer in business. Data concerning the original design can be found in Appendices F2, F3, and G. The construction contractor for the original construction is not known.

Around 1940 a drainage system was installed for the wet area on the downstream side of the dike. A drainage pipe from this area reportedly empties into Silver Stream.

In 1978 some concrete patching work was done to the concrete gravity portion of the dike. Also, steel bars have been bolted to the left training wall of the outlet pipe discharge channel to prevent the further widening of a large crack. The date of this repair is unknown.

There is no record of other construction, modification, or major repair of the dam or dike. Refer to Section 2 of this report, as well as the Engineering Data Checklist in Appendix F2, for a complete discussion of the design and construction history. Drawings, specifications, and other engineering data are included in Appendices F3 and G.

i. Normal Operation Procedures

The dam and dike are visited daily. The dam and dike are casually viewed at this time and the depth of water in the reservoir is measured from the top of the concrete portion of the dike and recorded.

The outlet pipe valve is opened when water from Silver Stream Reservoir is needed to fill downstream reservoirs. At the time of inspection the water level was at about EL 358, or about 5 feet below the spillway crest, and the outlet pipe valve was shut. The major downstream reservoir is Lake Washington about 1.5 miles downstream (see Drainage Area Map, Appendix C-5). Washington Dam, NY 00603, is covered by a separate Phase I Inspection report done in 1978 (Reference 31). Water from Silver Stream is directed to Washington Lake by Silver Stream Diversion Dam which is located about one mile downstream of Silver Stream Dam and Dike.

1.3 PERTINENT DATA

a. Drainage Area (square miles)	1.89
b. Discharge at Dam Site (cfs)	
Spillway-(W.S. at top of dam)	900
-(W.S. at top of dike)	590
Outlet Pipe (normally partially open)	
- (fully open w/W.S. at top of dam)	270
- (fully open w/W.S. at top of dike)	260
- (fully open w/W.S. at spillway crest)	240
Spillway & Fully Open Outlet Pipe Combined	
- (W.S. at top of dam)	1,170
- (W.S. at top of dike)	850
Maximum Known Flood	Unknown

c. Elevation (feet-NGVD)

Based on USGS mapping, the elevation base used on the design/construction drawings in Appendix G appears to be about 1.5 feet lower than NGVD (National Geodetic Vertical Datum of 1929). Therefore, all elevations used in this report are 1.5 feet higher than those found on the design/construction drawings in Appendix G and are in feet above mean sea level NGVD.

Top of Dam (and earth portion of dike)	368
Top of Dike (concrete gravity section)	366.5
Design High Water	Unknown
Spillway Crest (normal pool)	363
Entrance Invert of Outlet Pipe	345.6 ±

d. Reservoir Length (feet) - at spillway crest 8,000 ±

e. Reservoir Surface Area (acres)

Top of Dam	239 +
Top of Dike	227 ∓
Spillway Crest	198.2

f. Reservoir Storage (acre-feet)

Top of Dam	2,860
Top of Dike	2,464
Spillway Crest	1,538

g.

	Dam	Dike
Type	Earth with concrete core wall.	Earth with concrete core wall and concrete gravity section.
Length	About 557 feet, including spillway.	About 695 feet, including about 314 feet of concrete gravity section.
Height	About 22 feet.	About 18 feet (earth), 17 feet (concrete).
Top Width	About 15 feet.	About 15 feet (earth), 5 feet (concrete).
Side Slopes		
Upstream	About 2.5H:1V.	About 2.5H:1V (earth), vertical (concrete).
Downstream	About 2H:1V.	About 2H:1V (earth), top 12 feet of concrete nearly vertical with remainder about 0.7H:1V.

Zoning - None known for dam and earth portions of dike, n/a for concrete portion of dike.
Impervious Core - Concrete core wall in dam and earth portions of dike, n/a for concrete portion of dike.
Cutoff - In dam and earth portions of dike, concrete core wall extends down to firm material up to 20 feet below original ground. In concrete portion of dike, concrete gravity section extends down to 6 feet below top of firm material which is up to 20 feet below original ground.
Grout Curtain - None known for dam or dike.

h. Spillway
Type - Chute with concrete bridge deck across top.
Length of Weir - 30 feet.
Upstream Channel - Brush-choked approach section which tapers gradually up to weir crest from reservoir. Two angled concrete training walls upstream of spillway crest direct flow into spillway.

Downstream Channel - Concrete-paved chute with concrete training walls that curve along left abutment. Chute discharges at right angle into outlet pipe discharge channel at downstream toe.

i. Outlet Pipe

Size - 48-inch diameter.

Description - Cast iron pipe with leaded joints from control tower and intake on upstream side of dam to concrete and stone-paved discharge channel at downstream toe.

Control - 48-inch gate valve at the bottom of the control tower with a double hand crank bevel geared floor stand in gate house.

SECTION 2

ENGINEERING DATA

2.1 DESIGN DATA

a. Geology

There was no geologic information available in the design data for this dam. The following information was obtained from current geologic maps and publications for this region (References 28 and 29), as well as from the site visit.

Silver Stream Reservoir Dam is located at the eastern border of the Hudson Uplands section of the New England Province. The dam and dike are located at, or close to, a major thrust or reverse fault that separates the upthrown limestones and dolostones of Cambrian to Lower Ordovician age (approximately 550 million years old) to the north, from the shales, argillites and siltstones of Middle Ordovician age (approximately 475 million years old). Faulting in this region is presumably associated with the Taconic Orogeny, which created the Hudson Uplands section of New York State.

No surficial geologic information could be located for this vicinity.

b. Subsurface Investigations

There are no subsurface exploration data given in the design documents. It is indicated in the specifications that "soft material" or "mud" was specified to be excavated down to "firm" material prior to the start of construction of the embankments and the concrete dike. Apparently no soft material was allowed to remain in place under any portion of the dam or dike. The soft material under the dam is indicated to have been up to 18 feet deep, and the soft material or mud under the dike was indicated to be 12 to 20 feet deep. The firm material below the soft soils was referred to as an impervious clay and gravel mixture, which, based on visual observation of the area, probably is a lodgement till.

The cutoff wall and the outlet pipe were founded on the firm material.

c. Dam, Dike, and Appurtenances

The dam and dike were designed in 1922 and 1923 by Fuller and Harding (also Fuller and McClintock), Consulting Engineers, 170 Broadway, New York, New York, who are no longer in business.

A complete set of the original design/construction drawings for the dam are reproduced at reduced scale in Appendix G. Several representative portions of the as-built drawings for concrete placement can also be found as Appendices G-12 to G-15 (Owner has complete roll of as-built concrete placement drawings). Included in Appendix F3 are construction specifications for the dam and dike (see Appendix F3-1) as well as the application for its construction (see Appendix F3-40).

The embankments are composed of the soil referred to as a clay and gravel mixture (from borrow pits within 1000 feet and from the excavations for various parts of the dam), which presumably is the local glacial (lodgment) till. The specifications call for placement of the "most suitable and watertight clayey material found, free of stones larger than 4 inches" on the upstream side of the core wall. All embankment material was specified to be placed as follows:

1) Layers not over 6 inches thick.

2) Thoroughly rolled with heavy grooved roller weighing not less than 1000 lb/lin.ft., or a steam roller.

3) Sufficient water where directed to secure a "close connection between layers and close compacting of the material."

4) Where the roller cannot reach, the material was to be placed in the same manner and "thoroughly rammed."

The mud or soft material that was excavated beneath and adjacent to the concrete dike was replaced with a rolled fill and brought back up to the original ground surface, according to the drawings.

The spillway was to be cut entirely in natural ground according to instructions given by the Deputy State Engineer when he approved the application for construction.

2.2 CONSTRUCTION HISTORY

a. Initial Construction

The dam and dike were constructed in 1923. The original contractor for the dam is unknown. The only records found concerning the actual construction of the dam and appurtenances include tests results for concrete sand (see Appendix F3-48), field books of construction surveys available at the City of Newburgh Engineering Department, and the sequence of concrete placement in the core wall of the dam and gravity section of the dike as shown on the as-built drawings (representative portion included as Appendices G-12 to G-15).

b. Modifications, Repairs, and Maintenance

Around 1940 a drainage system was installed for the wet area on the downstream side of the dike. There is no record of this work but a drainage pipe from the wet area reportedly empties into Silver Stream just downstream of the Catskill Aqueduct siphon crossing.

In 1964 and 1965 a temporary tap was made into the siphon of the Catskill Aqueduct just downstream of the dam to supplement outflow from the reservoir during the drought.

In 1978 some visible holes and cracks in the concrete dike were cleaned and repaired by a city-employed mason. The only record of this work are photos taken by the Water Superintendent, samples of which are included on Appendix F3-52.

Also in the past, two steel bars were bolted to the left training wall of the outlet pipe discharge channel to prevent the further widening of a large crack. The date of this repair, which appears fairly old, is unknown.

c. Pending Remedial Work

There are no known plans for any remedial work at the dam.

2.3 OPERATION RECORD

a. Inspections

There is no record of inspection of the dam by the Owner.

Only one inspection report by the New York State Department of Environmental Conservation (NYS-DEC), dated September 18, 1974, could be found (see Appendix F3-51). This inspection report indicated that spillway and outlet works of the dam were in satisfactory condition. Seepage through the right spillway training wall was noted and it was reported that "No defects (were) observed beyond normal maintenance."

b. Performance Observations, Water Levels, and Discharges

Daily water level readings are taken from the top of the concrete portion of the dike. These readings have been recorded on the daily filter plant reports, from about 1960 to the present, which are sent to the State Health Department.

The City of Newburgh has a rain gage at the filter plant (about 1.5 miles northeast of the dam) and has rainfall records from 1950 to the present. The gage is presently being replaced and will resume operation soon.

No performance observations or routine measurements of discharges are known to exist.

c. Past Floods or Previous Failures

There are no records of past floods or previous failures.

2.4 EVALUATION

a. Availability

As listed on Appendix F1, engineering data and records for the dam are available from the Owner and the Dam Safety Section of the NYS-DEC. This data was reviewed, and copies of the records considered significant are included in chronological order in Appendices F3 and G. Appendix F2, Checklist for General Engineering Data and Interview with Dam Owner, also contains pertinent engineering information. Some data on the reservoir itself was also obtained from the NYS-DEC Division of Fish and Wildlife (see Appendix F3-50).

b. Adequacy

Available data consisted of design/construction drawings, specifications, as-built concrete placement drawings, correspondence, an application for construction, one inspection report, photos of 1978 repairs, and some data on reservoir depths. Such data as design calculations, complete data on foundation and embankment soils, and operation and performance data were not available. The lack of such in-depth engineering data does not permit a comprehensive review. Therefore, the available data was not adequate by itself to permit an assessment of the dam.

c. Validity

Based on field observation and checking, some of the data is not valid.

Alternate D (earth dam with concrete gravity section) was actually built for the dike (West Dam) according to the letter of Appendix F3-39 and the drawing of Appendix G-10. The construction specifications do not include this alternate.

The design/construction drawings do not show the existing bridge across the spillway.

The elevation base of the drawings appears to be about 1.5 feet lower than NGVD. Also the invert of the outlet pipe, by field measurements, is about 0.9 of a foot lower than the elevation shown on the drawings of Appendix G, after adjustment to NGVD.

SECTION 3

VISUAL INSPECTION

3.1 FINDINGS

a. General

Silver Stream Reservoir Dam and an associated dike were inspected on April 9, 1981. The inspection party was accompanied during part of the inspection by James W. Brown, Water Superintendent, who represented the Owner. The weather was cool and cloudy during the inspection, changing to rain around noon. The water surface was at about EL 358, or about 5 feet below the spillway crest. The Visual Inspection Checklists for the dam and dike are included as Appendix B, while selected photos taken during the inspection are included as Appendix A and as the Overview Photo at the beginning of this report. Appendix A-1 is a photo index map.

b. Dam and Dike

NOTE: The main dam, i.e., the right (easterly) embankment, will be referred to as the dam. The left (westerly) embankments and the concrete gravity section, taken together, will be referred to as the dike. The dike is divided into three parts: the left dike, the concrete dike, and the right dike.

1) Dam

There was no evidence of any sloughs or slides on the embankment.

Seepage - Seepage was passing through the dam and exiting downstream from the toe on the right side of the outlet pipe. The exit point was not observed since water was ponded a few inches deep between Sta 2+40 and 2+90, as shown on Photo A-4A. Clear seepage was flowing out of the downstream end of this pond (see Photo A-4B) at a rate of about 5 gpm. The channel of this seepage was rust-stained on the bottom. The head loss through the dam to this ponded zone was about 10 feet on the day of inspection.

Clear seepage was also observed exiting through cracks in the walls and floor of the spillway discharge channel. This discharge channel was cut in natural ground immediately downstream from the toe of the dam on the left side of the outlet pipe, as shown in the Overview Photo. The channel was cut about 4 to 6 feet deep into the natural ground which, in effect, makes the dam higher along the discharge channel than it would be

in the absence of the channel. A close-up view of one of the seeps in the wall and adjacent floor is shown in Photo A-9A. Seepage was observed as far to the left as Sta 4+50, at which point the head loss from the reservoir to the floor of the channel was only about 3 feet. More seeps are probably present beneath the standing water in the spillway discharge channel (see Photo A-8B), but are not observable. The total rate of flow from the observable seeps in the channel was about 10 to 15 gpm.

Animal Holes - Numerous animal holes were observed on the downstream slope of the dam, as listed below:

Station	Height Below Crest, ft.	Height Above Toe, ft.	Diameter in.
1 + 70	5		4
2 + 35		3	8
2 + 40		3	8
2 + 60		3	8
2 + 75		3	9
3 + 20		0	7
3 + 85	5		8
3 + 85	12		4
3 + 87	3		Not Estimated
4 + 40	7		6
4 + 70	7		5

In practically all cases the soil excavated near the hole appeared to be glacial till with silty, non-clayey fines.

Vegetation - The portion of the downstream slope to the right of Sta 2+00 is forested with hardwoods to 7 inches in size and a few small evergreens. The remainder of the downstream slope is covered with brush 3 to 10 feet high. Based on the size of the trees and verbal data from the Owner's representative, it appears that the trees and brush had been cut regularly until 10 or 15 years ago. Perhaps the portion to the left of Sta 2+00 has been cut more recently.

Brush to a height of 10 feet covers the upstream slope along a line at the normal water level (see Photos A-2B and A-3B).

2) Dike

There was no evidence of any sloughs or slides on the embankment portions of the dike.

Seepage - No seepage was observed on the downstream side of the left and right dikes. The concrete dike is cracked in several locations and streams of seepage through the cracks could be observed by walking along the crest. Streamlets were observed at the following locations at the surface of the water that is ponded downstream (see Photo A-11A).

Station	Approximate Flow, gpm
1 + 75	2
2 + 08	5-10
3 + 35	5-10

The differential head from the reservoir to the area downstream of the concrete dike was about 2 feet on the day of inspection.

Vegetation - The right dike is grass covered, except that a row of brush to 6 feet high exists along the top of the stone paving on the upstream slope (see Photo A-10B). The left dike is fully covered with brush and small trees on the downstream slope. Some cut branches were piled at the left end of the downstream toe. On the upstream slope there is a row of brush to 6 feet high at the top of the stone paving.

Animal Holes - Animal holes 4 to 6 inches in diameter were observed 1 to 3 feet below the crest on the downstream slope of the left dike at Stations 4+30, 4+40, 4+50 and 4+75.

Concrete Surfaces - There is efflorescence and some slight surface deterioration of all concrete surfaces of the dike (see Photos A-10A and A-10B). There is spalling at vertical construction joints in the concrete gravity section (see Photo A-11B). The horizontal pour joints in the concrete show signs of separation and cracking, along with efflorescence and spalling (see Photo A-11B). A large piece of concrete in the gravity section near the crest at Sta 4+00 is cracking and could eventually spall off from the gravity section (see Photo A-11A).

c. Appurtenant Structures

1) Intake Structure and Control Tower

The dam has a concrete intake structure and control tower on the upstream side. On top of the control tower there is a brick gate house with a slate-shingled roof (see Photo A-5A). The intake structure and the majority of the control tower were submerged and unobservable. The gate house and exposed portion of the control tower were inspected and are in good condition.

Inside the gate house there is a double hand crank bevel geared floor stand (see Photo A-5B) for operating the gate valve on the outlet pipe. This mechanism was well lubricated, operable, and in very good condition. The gate of the valve itself, although rusted and leaking somewhat when closed, also appeared in good condition (see Photo A-6B).

2) Outlet Pipe and Outlet Structure

The outlet pipe is a 48-inch-diameter cast iron pipe that has leaded joints with hemp or jute gaskets and concrete anti-seepage collars according to the drawings and specifications (see Appendices G-5 and F3-32). The inside of the pipe, one-third of which was full of water and unobservable, is only in fair condition. There were mineral deposits, as well as some seepage, at the joints (see Photo A-6B). The pipe was also rusting and scaling severely, with metal as thick as 1/2 inch flaking off in some places.

The outlet structure for the outlet pipe is a concrete headwall followed by a concrete discharge channel (see Photo A-6A). The spillway discharge channel intersects this channel at right angles about 16 feet downstream from the headwall of the outlet pipe. The outlet structure for the outlet pipe is in good condition. The outlet pipe discharge channel, however, is in poor condition. The left training wall of this channel, at its junction with the right training wall of the spillway, has a 2-inch-wide diagonal crack (see Photo A-7A). This crack is presently restrained by two steel bars which have been bolted to the concrete on either side of the crack to prevent the wall from collapsing.

3) Spillway and Discharge Channel

The chute spillway of the dam curves along the left abutment of the dam (see Photo A-2A) and intersects the discharge channel from the outlet pipe at its downstream end (see Photo A-9B). In general, the spillway and its discharge channel are in poor condition.

The approach channel to the spillway at the crest is choked with brush up to 6 feet high (see Photo A-7B). Flow in the spillway at the crest is also constricted by a concrete bridge deck across the spillway which provides access to the top of the dam.

The discharge channel training wall on the right (upstream) side has been tilted and cracked, as may be seen in Photo A-8B, probably due to frost action and the high earth pressure caused by the slope of the dam. The maximum tilt appears to be about 5 to 10 degrees from the vertical. The tilting is very minor on the left (downstream) training wall where the earth pressure is smaller.

There are about 14 cracks in the left spillway training wall for its full height. The vertical construction joints and horizontal pour joints are spalling and there is efflorescence and surface deterioration all over the wall. There is also one large spall at its downstream end where it intersects with the outlet pipe discharge channel.

There are about 15 cracks in the right spillway training wall for its full height. The vertical construction joints are spalling (see Photo A-9A) and there is seepage at the base of the wall. There is efflorescence and concrete deterioration of the entire wall. There is a large spall at about Sta 4+00 (see Photo A-8B) and another at Sta 3+00. There is also a 2-inch wide vertical crack at its downstream end, near its intersection with the left training wall of the outlet pipe.

The spillway channel paving is also in poor condition (see Photos A-8A and A-8B). Considerable cracking and deterioration of the concrete has occurred. Differential heave due to frost action may be the principal cause of this cracking.

4) Service Bridge

The service bridge from the top of dam to the gate house is a wood deck supported by steel I beams, with pipe railings (see Photo A-5A). The service bridge is generally in good condition. The bridge railings, however, are loose and the deck is bare wood for the most part.

d. Reservoir Area

The area around the reservoir is wooded with evergreens and hardwoods. The slopes are gentle to moderate (see Photos A-10A and A-11B).

e. Downstream Channel

The downstream channel is a paved stone trapezoidal channel that starts after the intersection of the spillway discharge channel with the outlet pipe discharge channel (see Photo A-9B). The channel is in good condition, clear of brush and debris. A concrete box culvert over the Catskill Aqueduct tends to restrict channel flow. About 100 feet downstream of this box culvert the channel is the natural stream channel which has brush and tree growth along its banks.

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3.2 EVALUATION

The trees and brush and their root systems should be removed from all surfaces of the dam and dike to avoid deterioration of the embankments and stone paving and to permit more thorough inspection. The brush should also be removed from the approach channel of the spillway.

The ponded water on the downstream side of the dam (to the right of the outlet pipe and in the discharge channel) and on the downstream side of the concrete dike prevent adequate inspection

in those areas. Any seepage that may be exiting downstream from the toe is covered by the ponded water. The ponded zones downstream from the dam should be drained and inspected. At that time the conduit should be inspected for seepage, particularly at the joints.

The tilted right training wall of the spillway should be further analyzed to determine the best method for its repair.

The training walls and concrete pavement of the outlet pipe and spillway discharge channels should be repaired. The concrete portions of the dike should also be repaired.

The deteriorated outlet pipe should be further evaluated to determine if it should be replaced or repaired.

The effects of seepage on stability of the dam are discussed in Section 6.1.

The animal holes on the downstream side of the dam near the toe are below the reservoir level and could become sources of seepage. (No such seepage was observed during the inspection.) These holes should be backfilled.

SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 OPERATION PROCEDURES

There are no written operation procedures for the dam.

Silver Stream Reservoir is used as a source of water supply. The gate valve on the outlet pipe is used to regulate outflow to downstream reservoirs. The normal position of the valve can be anywhere from full open to full closed depending upon water requirements downstream. The normal water level in the reservoir is usually at or below the spillway crest.

At the time of inspection the reservoir level was about 5 feet below the spillway crest at about EL 358, and the outlet valve was closed.

4.2 MAINTENANCE OF DAM AND OPERATING FACILITIES

There are no written maintenance procedures for the dam.

The dam and dike are visited daily. The site is casually viewed at this time and the water level is recorded. The outlet pipe valve is operated, when required, by Water Department employees. It takes two men to operate the valve because of its size.

The dam crest is regularly mowed but brush has not been cut on the dam and dike for the past several years. Other maintenance work at the dam is performed when funds, which are limited, are available.

4.3 EMERGENCY ACTION PLAN AND WARNING SYSTEM

There is no emergency action plan and warning system for the dam.

4.4 EVALUATION

Maintenance of the dam and dike is unsatisfactory. The condition of the dam and its appurtenances indicates that it receives some routine maintenance. Brush, however, covers the slopes of the dam and dike and clogs up the entrance to the spillway. Numerous animal burrows can be found in the embankments, and the spillway discharge channel is in a state of disrepair. Effective operation and maintenance procedures need to be developed and implemented by the Owner in order to avoid the continued deterioration of the dam and dike.

The Owner should develop an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 DRAINAGE AREA CHARACTERISTICS

Silver Stream Reservoir Dam and Silver Stream Reservoir are located on Silver Stream in southeastern New York. About 4 miles downstream of the dam Silver Stream joins Moodna Creek. Moodna Creek flows east and discharges into the Hudson River.

The total drainage area at the dam is 1.89 square miles, of which about 0.31 square miles (198.2 acres), or about 16% is actual reservoir surface at the spillway crest. Being near the Hudson River Valley, the topography is characterized by fairly flat slopes of less than 10%. Elevations in the drainage area vary from EL 363 to EL 540. (See Appendices C-5 and C-6).

5.2 ANALYSIS CRITERIA

The U.S. Army Corps of Engineers Hydrologic Engineering Center's Program HEC-1 DB (Reference 3) was used to develop the test flood hydrology and perform the reservoir routing.

The purpose of this analysis was to evaluate the dam and spillway with respect to their surcharge storage and spillway capacity. Accordingly, it was assumed that the water surface was at the spillway crest at the start of the flood routing. In addition, the outlet pipe was assumed to be fully open when water is one foot over the spillway crest.

A constant base flow of 2 cfs per square mile was chosen to represent average conditions in the drainage area and was inputted into the program for all subareas.

The index PMP (probable maximum precipitation) inputted to the HEC-1 DB program was 21.5 inches for a 24-hour duration all-season storm over a 200-square-mile basin, according to HMR 33 (Reference 4). Maximum 6-hour, 12-hour, 24-hour, and 48-hour precipitation for the actual size of the drainage area (same for 10 square miles or less) were inputted to the program as percentages of the index PMP in accordance with HMR 33. A storm reduction coefficient was then applied internally by the program in order to transpose or center the storm over the actual total drainage area. Thus, the corrected 48-hour PMP for the actual total drainage area became 24.4 inches. All rainfall was distributed using the Standard Project Storm arrangement embedded in the program.

Appendix C-7 summarizes the subarea, loss rate, and unit hydrograph data inputted to the program. Only two subareas were

used. Subarea 1 consists of all the drainage area around the reservoir, and Subarea 2 consists of just the reservoir surface. For the land in Subarea 1, loss rates were assumed to be 1.0 inch initially and a constant 0.1 inch per hour thereafter. Snyder unit hydrograph parameters were chosen from the 1977 Lower Hudson River Basin Hydrologic Flood Routing Model (Reference 20). A conservative standard lag time was computed. The program uses the inputted lag time and Snyder peaking coefficient to solve by iteration for approximate Clark coefficients, which are then used to calculate the runoff hydrograph.

For the reservoir surface making up Subarea 2, loss rates were set to zero so that rainfall would equal rainfall excess, or runoff. Assuming no delay in the rainfall/runoff response, a constant unit hydrograph for a rainfall duration equal to the HEC-1 DB calculation interval was developed per Appendix C-7 and input to the model.

The floods selected for analysis were the PMF (probable maximum flood) and 1/2 PMF. Peak inflow for the PMF is 6,800 cfs or 3,598 csm (cfs per square mile). Peak outflow is reduced substantially by reservoir routing to about 2,900 cfs (1,534 csm). For 1/2 PMF the peak inflow is 3,400 cfs (1,799 csm) and the routed peak outflow is 690 cfs (365 csm).

5.3 RESERVOIR CAPACITY

Storage capacity for the reservoir at the spillway crest, EL 363, was obtained from the application for construction of the dam dated July 29, 1923 (see Appendix F3-42). USGS contour mapping (see Appendix C-5) was used to obtain area measurements inside contour elevations above the spillway crest and the capacity of the reservoir for these areas was hand-computed by the method of conic sections. A tabulation of the reservoir volumes inputted to the program is on Appendix C-6.

At the spillway crest, EL 363, the reservoir has a capacity of 1,538 acre-feet. At the top of dike, EL 366.5, the reservoir has a capacity of 2,464 acre-feet, and at the top of dam, EL 368, the reservoir has a capacity of 2,860 acre-feet. Surcharge storage between the spillway crest and the top of dike amounts to 926 acre-feet, or about 9.2 inches of runoff from the 1.89-square-mile drainage area. Thus, the reservoir has significant capacity to attenuate peak inflow.

5.4 SPILLWAY CAPACITY

The dam has a 30-foot-long concrete chute spillway with a concrete bridge deck across the top. The crest of the chute spillway is about 5 feet below the top of dam (3.5 feet below the top of dike), with a clear opening under the bridge deck of 3.5 feet.

The discharge capacity for the spillway was computed assuming critical flow over an ideal broad-crested weir for flow depths of 3.5 feet or less (under the bridge). Reduction in discharge capacity due to abutments contractions was accounted for. For flow depths between 3.5 feet and 5 feet, discharge capacity was computed assuming orifice flow. For flow depths greater than 5 feet, discharge capacity was computed assuming orifice flow under the bridge deck and ideal broad-crested weir flow over it. The spillway discharge computations are presented on Appendix C-9. With water 3.5 feet over the spillway crest (water level at top of dike, EL 366.5) the spillway discharges about 590 cfs.

Total discharge from the dam consists of flow from the spillway as well as flow through the outlet pipe when it is fully open. The capacity calculations for the outlet pipe appear on Appendix C-8. The sum of the hand-computed discharges for the spillway and outlet pipe (see Appendix C-10) were inputted directly to the HEC-1 DB program. Flow over the dike and dam was computed by the HEC-1 DB program using the non-level crest-critical-flow routine embedded in the program.

With the reservoir level at the top of dike, EL 366.5, the total discharge from the dam is the combined capacity of the spillway and outlet pipe, or about 590 + 260 = 850 cfs. At the top of dam, total discharge capacity of the spillway and outlet pipe combined is 900 + 270 = 1,170 cfs.

5.5 FLOODS OF RECORD

There are no known records of past flood discharges at the dam.

5.6 OVERTOPPING POTENTIAL

The results of the overtopping analysis using the HEC-1 DB program are summarized in Table 5.1. The overtopping computer input and output for the PMF and 1/2 PMF are included starting on Appendix C-11.

As noted from Table 5.1, the PMF overtops the dike by about 1.5 feet with duration of overtopping of about 6.3 hours. The 1/2 PMF does not overtop the dike, but instead results in minimum freeboard of about 0.7 of a foot. Peak inflows are 6,800 cfs for the PMF and 3,400 cfs for 1/2 PMF. Peak outflows are reduced substantially by reservoir routing to 2,900 cfs for the PMF and 690 cfs for 1/2 PMF. Time to maximum stage, or the time from the start of the 48-hour storm to peak outflow, is about 42 hours for the PMF and 43 hours for 1/2 PMF. The peak portion of the inflow and outflow hydrographs for the PMF and 1/2 PMF are shown by the computer plots on Appendices C-17 and C-18.

TABLE 5.1

SILVER STREAM RESERVOIR DAM

OVERTOPPING ANALYSIS

CONDITIONS

Total Drainage Area = 1.89 square miles
Start Routing at Spillway Crest EL 363
Top of Dike EL 366.5 (concrete gravity section), Top of Dam EL 368
Total Project Discharge Capacity at Top of Dike = 850 cfs ± due to Spillway and outlet pipe fully open. (e)
Some values rounded from computed results.

	PMF	1/2 PMF (a)
INFLOW		
48-hour Rainfall (inches)	24.4	14.1 (b)
48-hour Rainfall Excess (inches) (c)	20.7	10.4 (d)
Peak Inflow (cfs)	6,800	3,400
Peak Inflow (csm)	3,598	1,799
OUTFLOW		
Peak Outflow (cfs)	2,900	690
Peak Outflow (csm)	1,534	365
Time to Peak Outflow (hours)	42.2	43.2
Maximum Storage (acre-feet)	2,843	2,284
Max. W.S. Elevation (feet-NGVD)	367.9	365.8
Minimum Freeboard (feet) - Dike	overtopped	0.7
- Dam	0.0	2.2
Maximum Depth over Dike (feet)	1.5	not overtopped
Duration of Overtopping (hours)	6.3	n/a

(a) One-half of PMF total runoff, including base flow. For PMF base flow = 2 cfs per square mile = 4 cfs ± .
(b) Approximation assuming total losses are the same as for the PMF.
(c) Rainfall Excess = Rainfall for the Reservoir Surface. For the rest of the drainage area, losses are assumed to be 1.0 inch initially and 0.1 inch per hour thereafter.
(d) Equal to one-half of PMF value.
(e) If outlet pipe is closed, total discharge capacity at Top of Dike = 590 cfs ± ; for PMF, peak outflow = 3,300 cfs and dike overtopped by 1.7 feet; for 1/2 PMF, peak outflow = 540 cfs and minimum freeboard = 0.2 feet.

Silver Stream Reservoir Dam (and Dike) was also modeled to see what would happen if the outlet pipe was not open during the PMF and 1/2 PMF. For this case the total project discharge capacity at top of dike, EL 366.5, is about 590 cfs. The PMF results in a peak outflow of 3,300 cfs and overtops the dike by about 1.7 feet. The 1/2 PMF for this case results in a peak outflow of 540 cfs and does not overtop the dike, but instead results in a minimum freeboard of about 0.2 of a foot. The computer input and output are not included in this report, but the results are summarized by footnote (e) on Table 5.1.

5.7 EVALUATION

The PMF overtops the dike, but not the dam embankment, even when the outlet pipe is fully open. The 1/2 PMF, however, does not overtop the dike, or the dam embankment which is 1.5 feet higher than the dike. Therefore in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "inadequate", but not seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

There was no evidence of movement that would indicate concern about the structural stability of the dam or dike.

Seepage was observed on the downstream side of the dam. On the left side of the outlet pipe, the right training wall of the spillway discharge channel is tilted into the channel. At this location there is seepage entering the channel through cracks in the wall. It is probable that the tilted wall will ultimately tip over, at which time the seepage through the dam would increase. In addition, flow through the discharge channel could erode the toe of the dam. Preventive maintenance on the wall is required to avoid further deterioration and potential stability problems.

The ponded water downstream from the dam obscures any seepage that may be occurring. The existence of, or potential effects of such seepage, cannot be determined until these areas are drained and inspected.

b. Design and Construction Data

The drawings and specifications indicate that this dam was well and conservatively designed.

The spillway discharge channel is cut into natural ground at the toe of the dam. This feature could lead to erosion of the toe if the flow overtopped or undermined the right training wall. It would have been preferable to locate the discharge channel well downstream from the toe.

No existing stability analysis was found for any part of the dam or dike.

c. Operating Records

No operating records were found or operational problems reported which would adversely affect the stability of the dam or dike.

d. Post-Construction Changes

No post-construction changes are known which would adversely affect the stability of the dam or dike.

e. Seismic Stability

This dam and dike are in Seismic Zone 1. According to Recommended Guidelines (Reference 1), a seismic stability analysis is not required.

6.2 STABILITY ANALYSIS

The central portion of the dike is a concrete gravity section, with a bend point near each end, about 314 feet long by about 17 feet high from original ground to top of dike. An independent structural stability analysis was performed on a critical section of the concrete dike. The cross section for analysis was chosen just toward the center from either bend point where the exposed height is large compared to the height below ground and where there is earth pressure on the upstream side due to the wrapped-around slope of the earth embankment portion of the dike. The cross section geometry is based on the design/construction drawings (see Appendix G-10), the as-built concrete placement drawings (see Appendix G-14), and observation during the visual inpsection. The following loading cases were analyzed:

Case 1 - Normal pool at spillway crest EL 363 or 3.5 feet below top of dike, normal tailwater at the surface of the ground by observation or 16 feet below top of dike, full headwater and tailwater uplift, top of wrapped-around upstream slope of embankment estimated at 10 feet below top of dike.

Case 2 - Normal pool at spillway crest, ice load of 5 kips per linear foot for ice 1.0 foot thick, remaining conditions same as Case 1.

Case 3 - Half PMF pool at EL 365.8 or 0.7 of a foot below top of dike, no flood tailwater above normal tailwater, remaining conditions same as Case 1.

Case 4 - Full PMF pool at EL 368.0 or 1.5 feet above top of dike, flood tailwater estimated at 11 feet more than normal tailwater or 5 feet below top of dike due to ponding caused by Catskill Aqueduct embankment, remaining conditions same as Case 3.

The results of the stability analysis are summarized in Table 6.1. The computations are included as Appendix D.

For all loading cases analyzed, minimum satisfactory overturning stability is considered to be a factor of safety of 1.5 with the resultant passing through the middle third of the base. For sliding stability, because of the high loading conditions and the conservative assumptions made about foundation material properties, a minimum satisfactory factor of safety of 2.0 is considered appropriate for all the loading cases analyzed, rather than the customary 3.0.

TABLE 6.1

SILVER STREAM RESERVOIR DAM

STABILITY ANALYSIS OF CONCRETE DIKE

CASE	OVERTURNING			SLIDING FACTOR OF SAFETY (c)
	FACTOR OF SAFETY (a)		LOCATION OF RESULTANT (b)	
1- Normal Pool	1.69		0.42b	1.15 unsatisfactory
2- Normal Pool plus Ice Load	1.00	unstable	0.00b	0.69 unstable
3- Half PMF Pool	1.28	unsatisfactory	0.24b	0.75 unstable
4- Full Pmf Pool	1.27	unsatisfactory	0.28b	1.16 unsatisfactory

(a) Overturning factor of safety is ratio of resisting moments to driving moments taken about the toe.

(b) Distance from toe to point where resultant passes through base, expressed in terms of base dimension "b". Middle third of base is 0.33b to 0.67b.

(c) Sliding factor of safety is ratio of resisting forces to driving forces taken along horizontal failure plane.

Both overturning and sliding stability must be satisfactory in order for stability of the section to be satisfactory.

As noted from Table 6.1, the concrete dike is unstable for the winter ice load and 1/2 PMF conditions (Cases 2 and 3, respectively) and has unsatisfactory stability for the normal spring-summer-fall condition (Case 1) and the full PMF condition (Case 4).

For Case 4, the full PMF condition which overtops the dike, it should be noted that the full weight of the flowing water on the downstream face of the section was taken into account as a resisting force. Considering the relatively steep face of the section and the substantial head and discharge for the PMF condition, it is probable that the flowing water would exert little to no pressure - or even negative pressure - on the face of the section. Therefore, actual stability of the concrete dike under such a flood condition might be even more unsatisfactory than presently indicated.

It is interesting to note that the dike has much higher factors of safety for the PMF condition (Case 4) than would be expected when compared to the 1/2 PMF condition (Case 3). The sliding factor of safety for the PMF condition is, in fact, higher than for the 1/2 PMF condition. This unusual occurrence is due to the stabilizing effect of tailwater ponded at the downstream toe of the dike, caused by the Catskill Aqueduct berm just downstream, as the dike is being overtopped by the PMF. On the other hand, 1/2 PMF does not overtop the dike and there is no ponded tailwater above normal conditions at the downstream toe.

In view of the apparent unsatisfactory stability and instability of the concrete dike, it is recommended that a detailed structural stability investigation of the concrete dike be conducted to better assess its stability under all loading conditions. This should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dike. The investigation should determine what modifications to the dike, if any, are necessary to achieve satisfactory stability.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Visual inspection of Silver Stream Reservoir Dam and Dike revealed the following deficiencies which affect the safety of the structure:

1) Cracks, seepage through, and tilting of the right training wall of the spillway discharge channel, which forms the downstream toe of the dam, and deterioration and heaving of the floor of the discharge channel.

2) Seepage through the dam to the right of the outlet pipe.

3) Some cracking and deterioration of portions of the concrete dike.

4) Trees growing on a portion of the downstream slope of the dam and brush growing on portions of the dam embankment and dike embankments.

5) Many animal holes on the downstream slopes of the dam and the left embankment of the dike.

Hydrologic and hydraulic analysis indicates that the PMF overtops the dike, but not the dam embankment, even when the outlet pipe is fully open. The 1/2 PMF, however, does not overtop the dike, or the dam embankment which is 1.5 feet higher than the dike. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "inadequate", but not seriously inadequate.

Structural stability analysis of the concrete dike indicates that it is unstable for the winter ice load and 1/2 PMF conditions and that it has unsatisfactory stability for the normal spring-summer-fall condition and the PMF condition.

b. Adequacy of Information

Available information together with that gathered during the visual inpsection, while considered adequate for this Phase I inspection, is deficient in the following respects:

1) The ponded water on the downstream side of the dam to the right of the outlet pipe, in the discharge channel, and downstream from the dike prevents adequate inspection of those areas.

2) There is no data available on the actual material properties of the soil foundation under the concrete dike. The lack of such data critically affects the structural stability analysis of the dike.

3) Minor inconsistencies in the engineering data available, based on field observation and checking, are itemized in Section 2.4c.

c. Need for Additional Investigations

The following detailed engineering investigations should be performed by a registered professional engineer qualified by training and experience in the design of dams:

1) Perform a detailed structural stability analysis of the concrete dike to better assess its stability under all load conditions. This should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dike.

2) Inspect for seepage in the outlet pipe and within the areas of ponded water downstream from the dam and dike, including the spillway discharge channel, after those areas have been drained as recommended in Section 7.2a. Establish an appropriate monitoring system, if necessary.

3) Inspect the deterioration inside the outlet pipe and determine if the pipe needs to be repaired or replaced.

d. Urgency

The investigations recommended above in Section 7.1c should be started within 6 months after receipt of this Phase I Report by the Owner.

Any remedial work deemed necessary as a result of these investigations should be completed within 18 months after receipt of this report by the Owner.

Measures recommended below in Section 7.2a should be completed within 12 months after receipt of this report by the Owner.

7.2 RECOMMENDED MEASURES

The following work should be performed by the Owner. Where engineering assistance is indicated, the Owner should engage a registered professional engineer qualified by training and experience in the design of dams. Assistance by such an engineer may also be useful for some of the other work.

a. Complete Within 12 Months

1) Institute a program to visually inspect - not just casually look at - the dam, dike, and their appurtenances at least once a month.

2) Remove the brush from the approach channel of the spillway.

3) Drain the ponded water downstream from the dam, dike, and from the spillway and outlet pipe discharge channels so that those areas can be inspected by an engineer. Also, dewater the outlet pipe so that it can be inspected.

4) Repair the right training wall and the floor of the spillway discharge channel in accordance with design and field observation of the work by an engineer.

5) Remove trees, brush, and their root systems from the slopes of the dam and dike embankments and to a distance of 15 feet downstream from their toes in accordance with specifications and field observation of the work by an engineer. Fill resulting holes with properly selected, compacted backfill. Continue to keep these same areas and the crest of the dam and dike embankments clear by cutting, mowing, and cleanup at least annually.

6) Backfill animal holes on the slopes of the dam and dike embankments with properly selected, compacted fill.

7) Contingent on the results of the detailed structural stability analysis of the concrete dike, repair the cracking and deterioration of portions of the dike in accordance with design and field observation of the work by an engineer.

8) Prepare written routine operation and maintenance procedures for the dam, dike, and their appurtenances.

9) Institute a program of comprehensive technical inspection of the dam, dike, and their appurtenances by an engineer on a periodic basis of at least once every two years.

10) Develop an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system. Also make provisions to open the outlet pipe valve, when necessary, to augment spillway flow during periods of heavy runoff.

b. Complete Within 18 Months

The following remedial work should be completed by the Owner. A qualified, registered professional engineer should design and observe the construction of the remedial work.

1) Appropriate modifications as a result of the detailed structural stability analysis of the concrete dike.

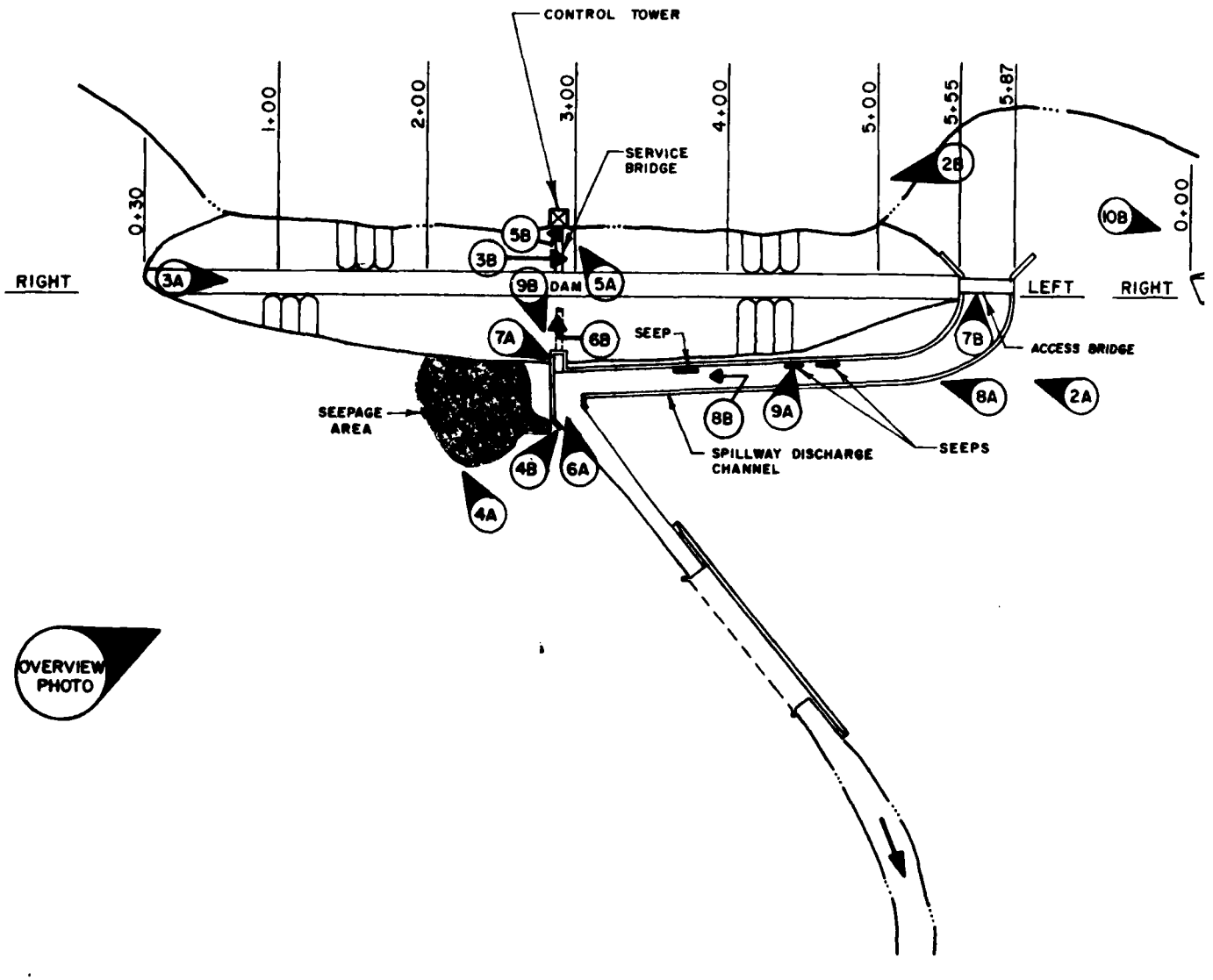
2) Appropriate modifications as a result of inspecting for seepage in drained areas downstream from the dam and dike, including the spillway discharge channel, and in the outlet pipe.

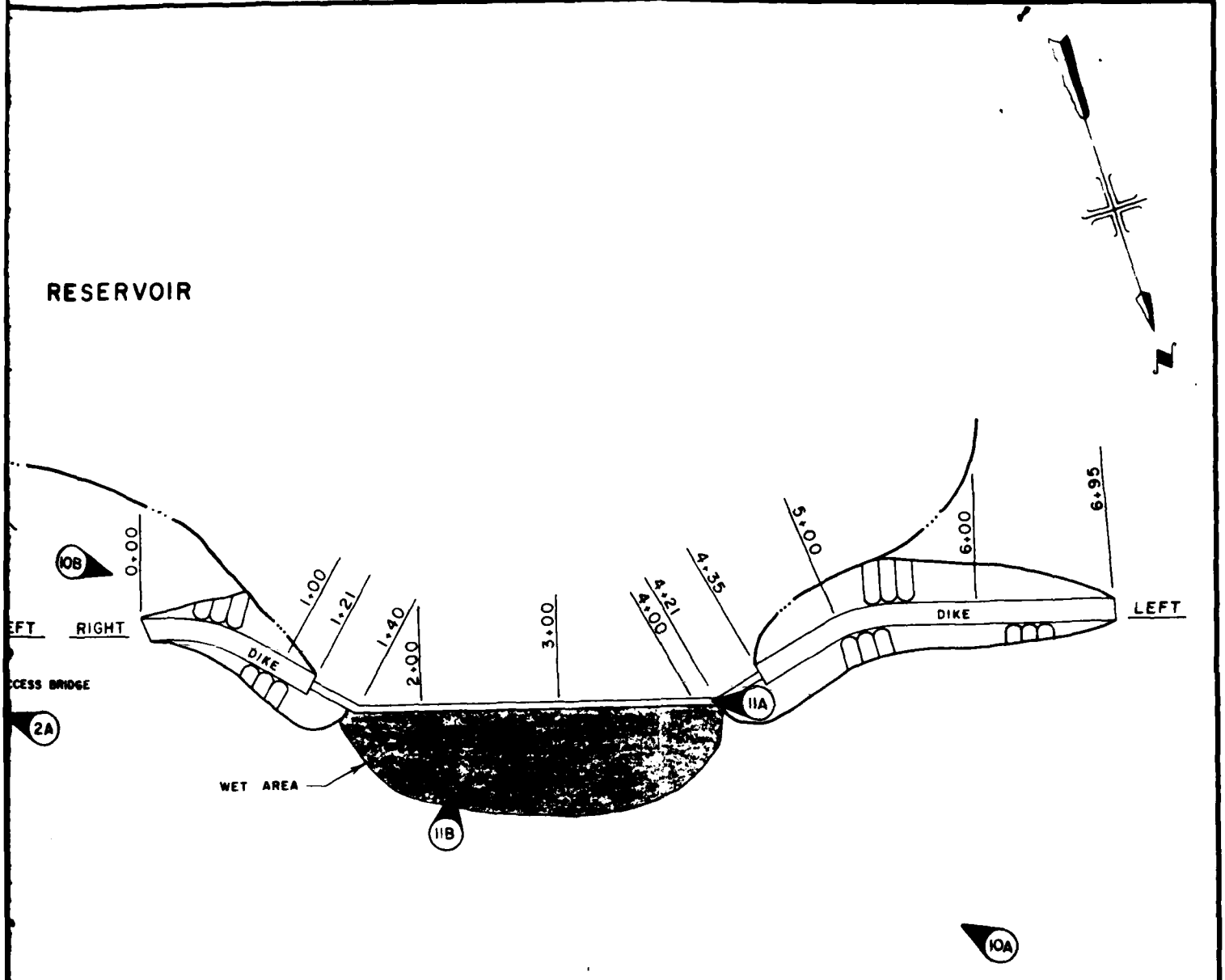
3) Appropriate modifications as a result of inspecting the deterioration inside the outlet pipe.

APPENDIX A

PHOTOGRAPHS

SILVER STREAM RESERV





SILVER STREAM RESERVOIR DAM
PHOTO INDEX MAP

TOWN OF NEW WINDSOR	ORANGE CO., N.Y.
SCALE NONE	DATE JULY 1981

C T. MALE ASSOCIATES, P.C.
1000 TROY ROAD SCHENECTADY N Y 12309
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS

PROJECT NO 58-01-00010/80.650

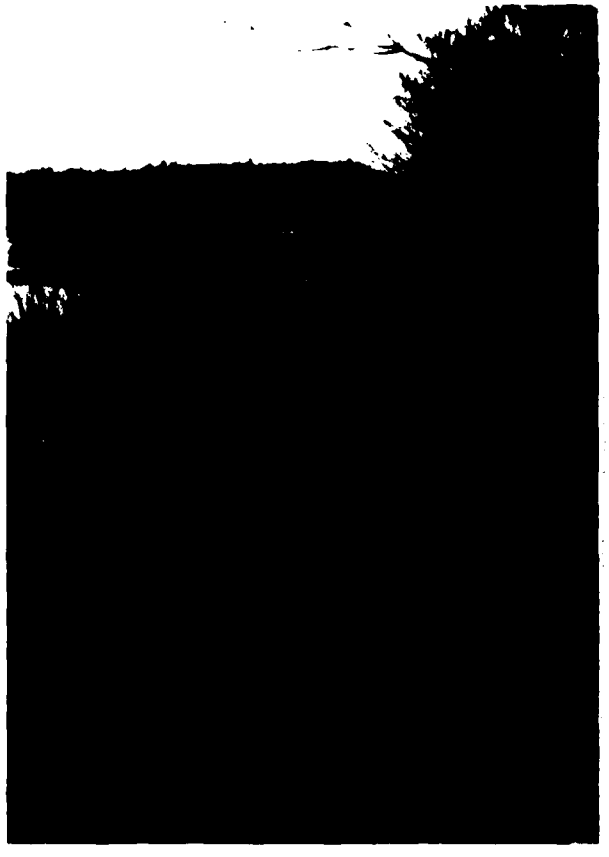
A-1

2

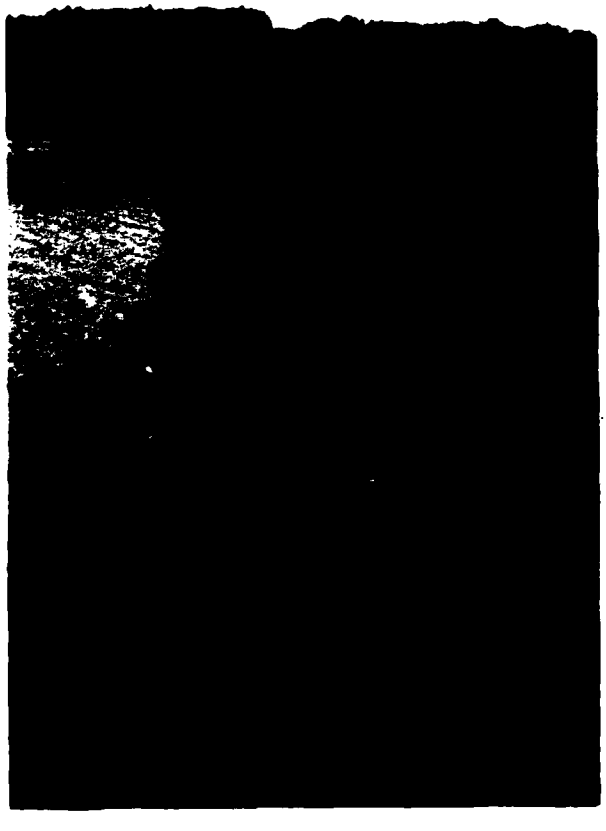
DWG. NO. 81-15

A-2A Downstream slope of dam and spillway from natural ground between dam and dike - 4/9/81

A-2B Upstream slope of dam looking toward right abutment - 4/9/81



A-3A Top of dam looking toward left abutment - 4/9/81

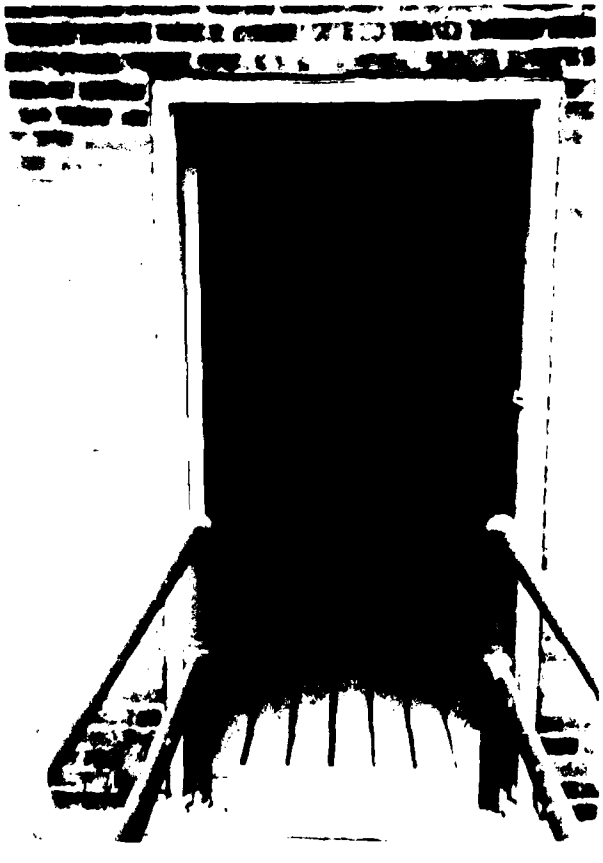


A-3B Upstream slope of dam with riprap, looking from service bridge toward left abutment - 4/9/81

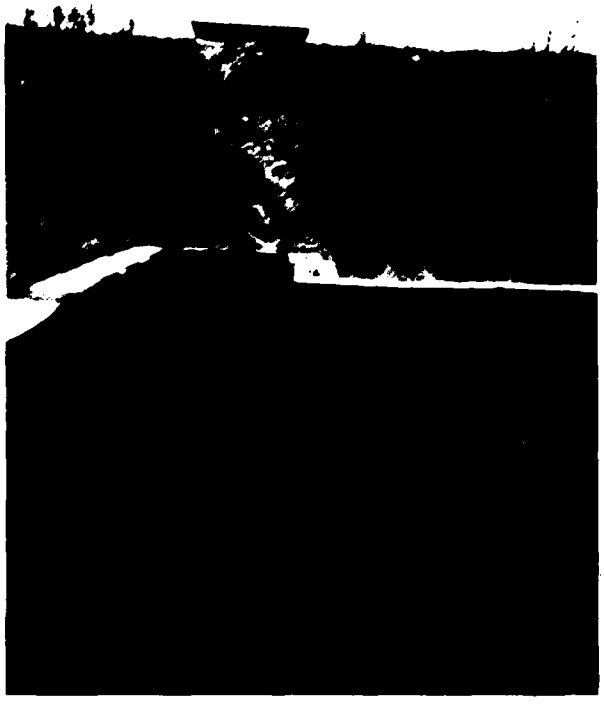
A-4A Ponded seepage at toe of dam to the right of outlet pipe discharge channel - 4/9/81

A-4B Seepage on right side of discharge channel. Wall in photo is the downstream end of the right training wall of outlet pipe discharge channel, which is shown at right in Photo A-9B 4/9/81

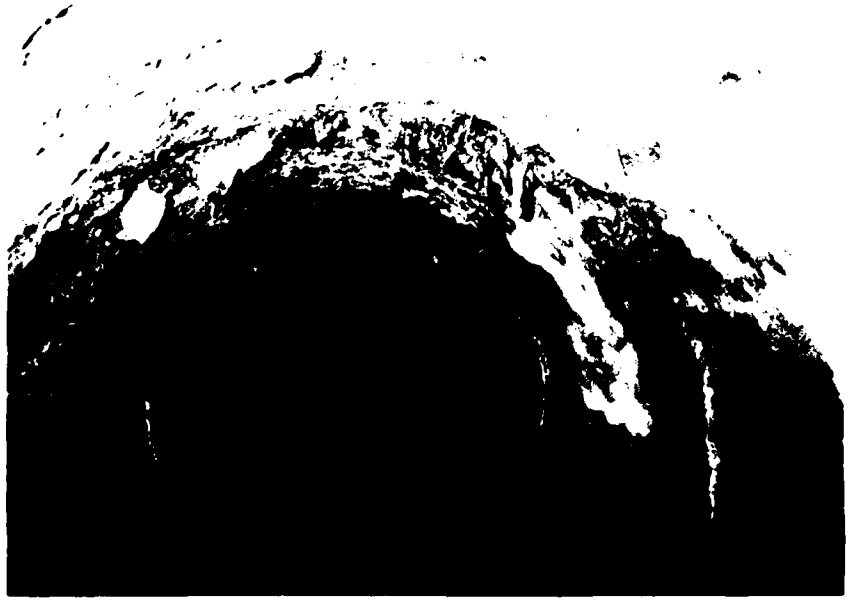
A-5A Control tower with gate house and service bridge - 4/9/81



A-5B Double hand crank bevel geared floor stand for valve on outlet pipe - 4/9/81



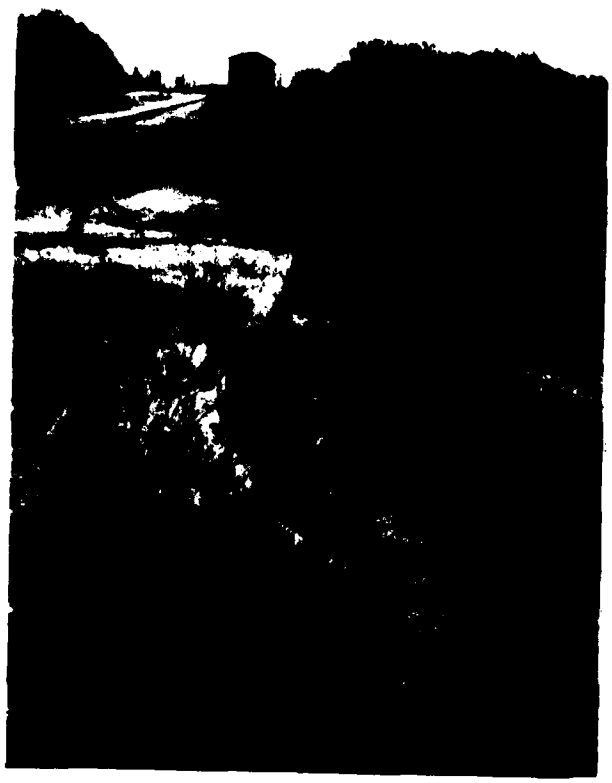
A-6A End of outlet pipe looking upstream - 4/9/81



A-6B Inside of outlet pipe looking upstream toward gate valve - 4/9/81

A-7A Crack with steel strapping in left training wall of outlet pipe discharge channel - 4/9/81

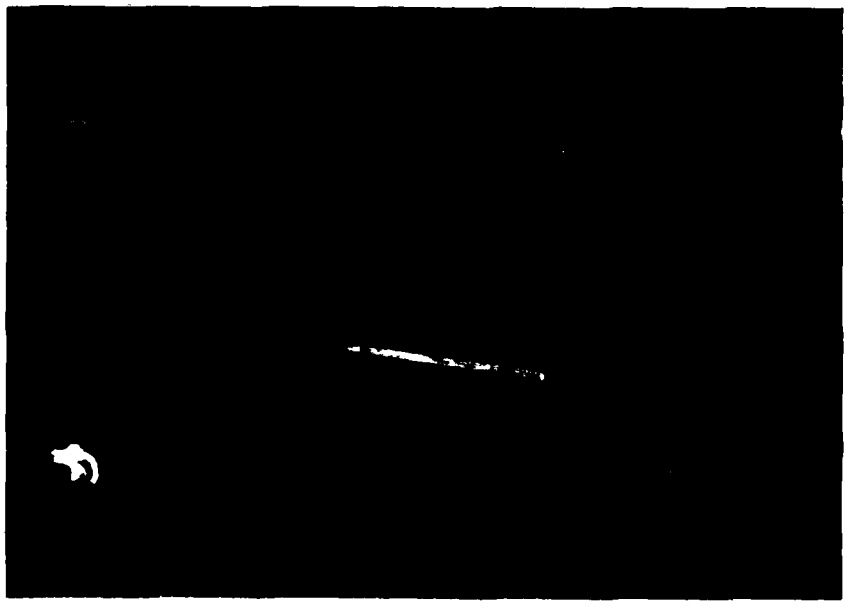
A-7B Crest of chute spillway with bridge deck over top looking upstream - 4/9/81



A-8A Spillway discharge channel looking downstream toward its intersection with outlet pipe discharge channel 4/9/81

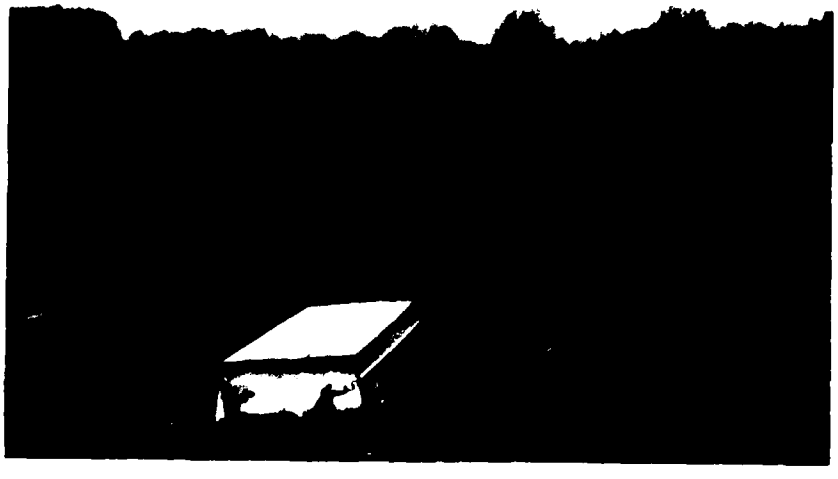
A-8B Spillway discharge channel looking downstream as in Photo A-8A. Note large spall and seep from right training wall which is tilted into channel - 4/9/81

A-9A Typical seep from right training wall of spillway discharge channel - 4/9/81

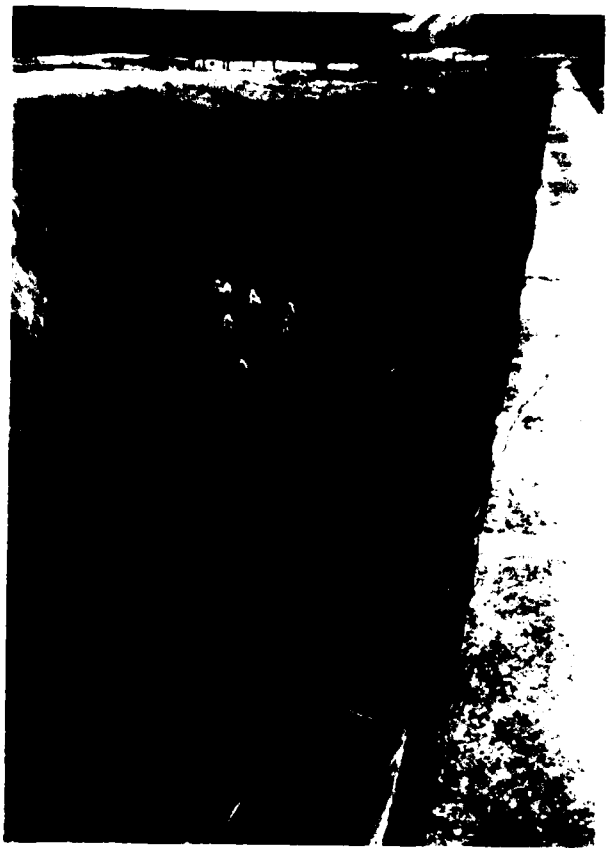


A-9B Discharge channel from a point over the outlet pipe looking downstream. Spillway discharge channel enters from left in photo - 4/9/81

A-10A Dike from Catskill Aqueduct looking upstream toward right abutment. Note dam in background - 4/9/81



A-10B Upstream side of concrete portion of dike, with earth portions to the right and left, from natural ground between dam and dike 4/9/81



A-11A View along top of concrete portion of dike looking toward right abutment. Note ponded water at a seep shown in foreground and crack in concrete shown at right center 4/9/81

A-11B Close-up of downstream side of concrete portion of dike. Note cracking and effloresence - 4/9/81

APPENDIX B

VISUAL INSPECTION CHECKLIST

PHASE I

VISUAL INSPECTION CHECKLIST

1. BASIC DATA

a. General

Name of Dam Right (East) Embankment Silver Stream Reservoir Dam

Fed. I.D.# NY00511 DEC Dam No. 531

River Basin LOWER HUDSON

Location: Town NEW WINDSOR County ORANGE

Stream Name SILVER STREAM

Tributary of MOODNA CREEK

Latitude (N) 41° 28.7' Longitude (W) 74° 5.2'

Type of Dam EARTH

Hazard Classification HIGH

Date(s) of Inspection April 9, 1981

Weather Conditions COOL & CLOUDY, W/ RAIN STARTING @ 1CAM

Reservoir Level at Time of Inspection EL 258
(5' BELOW SPILLWAY CREST)

b. Inspection Personnel (*Recorder) THOMAS BENNEDUM - CTM,
EDWIN VOPELAK JR.* - CTM, STEVE J. POULOS - GEI

c. Persons Contacted (Including Title, Address & Phone No.)

JAMES W. BROWN, WATER SUPERINTENDANT
NEWBURGH WATER DEPT., 79 DUBOIS ST., NEWBURGH, N.Y. 12550
(914) 565-3356

d. History
Date Constructed 1923 Date(s) Reconstructed N/A

Designer FULLER & HARDING CONSULTING ENGR. (FULLER & MCCLINTOCK)
(NO LONGER IN BUSINESS)

Constructed By UNKNOWN

Owner CITY OF NEWBURGH, CITY HALL, 83 BROADWAY,
NEWBURGH, N.Y. 12550, ATTN: GARY J. BLOOMQUIST, CITY MANAGER
(914) 565-3333

2. EMBANKMENT

a. Characteristics

GEI 1) Embankment Material Probably glacial till, based on soil excavated in animal holes.

GEI 2) Cutoff Type Plans show concrete cutoff 4 ft into natural glacial till. Cutoff is about 3 ft thick. No reinforcing shown.

GEI 3) Impervious Core Concrete core wall, unreinforced, shown on plans. 18 in. thick at top 3 ft thick at bottom.

GEI 4) Internal Drainage System None shown.

GEI 5) Miscellaneous Unreinforced concrete collars shown on most joints of 48 in cast iron blow-off pipe.

GEI b. Crest (OUTLET)

GEI 1) Vertical Alignment Very good. Irregularities are slight (± 2 in.).

GEI 2) Horizontal Alignment Very good.

GEI 3) Lateral Movement None observed.

GEI 4) Surface Cracks None observed.

GEI 5) Miscellaneous Grassed surface. Car tracks are grassed and ~2 in. deep.

GEI c. Upstream Slope

GEI 1) Slope (Estimate H:V) 2½ H:1V.

GEI 2) Undesirable Growth or Debris, Animal Burrows Brush to 10 ft high from normal pool to crest. No animal holes. Minor debris. Pool now is 5 ft below normal.

GEI 3) Sloughing, Subsidence or Depressions None observed.

GEI 4) Slope Protection Very good. Flat sandstone or limestone rocks laid on edge. Mostly 8-12 in max dim. Up to 6-24 in.

GEI 5) Surface Cracks or Movement at Toe No cracks on slope. Toe not visible.

GEI d. Downstream Slope

GEI 1) Slope (Estimate - H:V) 2H:1V

GEI 2) Undesirable Growth or Debris, Animal Burrows Sta 0 to 2+00: fully forested with hardwoods to 7 in. Sta 2+00 to end: fully brush covered to 10 ft high. Animal holes at 4+70, 4+40, 3+85, 3+87, 1+70 @ 3 to 7' below crest; @ 3+20, 2+75, 2+60, 2+40, 2+35 @ toe.

GEI 3) Sloughing, Subsidence or Depressions None. Surface quite smooth.

GEI 4) Surface Cracks or Movement at Toe None. See spillway discharge channel for concrete wall movement.

GEI 5) Seepage See spillway discharge channel also. Water ponded downstream at toe to right of blowoff conduit, from Sta 2+40 to 2+90

GEI 6) External Drainage System (Ditches, Trenches, Blanket) None. Spillway discharge channel is downstream at toe on left side of dam.

GEI 7) Condition Around Outlet Structure Mushy to the right from Sta 2+30 to 2+90 about the ponded water.

GEI 8) Seepage Beyond Toe ~5 gpm clear from ponded water flowing out to right of right training wall of blowoff discharge channel.

GEI e. Abutments - Embankment Contact

Good condition

GEI 1) Erosion at Contact None

GEI 2) Seepage Along Contact None

3. DRAINAGE SYSTEM

GEI a. Description of System None

GEI b. Condition of System N.A.

GEI c. Discharge from Drainage System N.A.

4. INSTRUMENTATION (Monumentation/Surveys, Observation Wells, GEI Weirs, Piezometers, Etc.)

None

5. RESERVOIR

GEI a. Slopes Gentle slopes. Wooded. Evergreen and hardwoods.

GEI b. Sedimentation Not observed

GEI c. Unusual Conditions Which Affect Dam Water in pool was very low (5ft below normal). Seepage may be greater at normal water levels.

6. AREA DOWNSTREAM OF DAM

a. Downstream Hazard (No. of Homes, Highways, etc.) 200' D/S DISCHARGE CHANNEL CROSSES CATSKILL AQUEDUCT (RAW WATER TRANSMISSION MAIN FOR NYC) BETWEEN 2000' AND 5000' D/S 4 DWELLINGS, A TOWN RD. (MOORES HILL RD.) & STATE RTE 207.

GEI b. Seepage, Growth Meadow. Low brush.

GEI c. Evidence of Movement Beyond Toe of Dam See spillway discharge channel

d. Condition of Downstream Channel STONE PAVED CHANNEL, THROUGH CONCRETE BOX CULVERT UNDER AQUEDUCT TO NATURAL STREAM 100' PAST AQUEDUCT. IN GOOD CONDITION & CLEAR OF DEBRIS. DEPENDING ON NATURAL CHANNEL IS NOT ADEQUATE TO HANDLE FLOW FROM OUTLET OPENED FULL.

7. SPILLWAY(S) (Including Discharge Channel)

a. General CONCRETE CHUTE SPILLWAY AT LEFT ABUTMENT OF DAM W/ CONCRETE BRIDGE DECK ACROSS TOP TO PROVIDE ACCESS TO DAM, CONCRETE DISCHARGE CHANNEL CURVES ALONG ABUTMENT TO TOE & INTERSECTS OUTLET CONDUIT DISCHARGE CHANNEL & THEN FLOWS TO STREAM IN STONE PAVED CHANNEL

b. Conditon of Service Spillway - GENERALLY IN POOR CONDITION LEFT TRAINING WALL - ABOUT 14 CRACKS IN WALL TO FULL HEIGHT, CONSTRUCTION JOINTS SPALLING, DETERIORATION & EFFLORESCENCE ALL OVER WALL, LARGE SPALL AT D/S END NEAR 90° BEND POINT. RIGHT TRAINING WALL - ABOUT 15 CRACKS IN WALL TO FULL HEIGHT, CONSTRUCTION JOINTS SPALLING, DETERIORATION & EFFLORESCENCE ALL OVER WALL, LARGE SPALLS AT ABOUT STA 4+00 (5 CF. CONC.) & STA 3+00 (1 CF. CONC.). AT D/S END NEAR CORNER W/ OUTLET PIPE DISCHARGE CHANNEL WALL HAS 2 LARGE (2" WIDE) CRACKS, ONE VERTICAL ON SPILLWAY TRAINING WALL, ONE DIAGONAL ON OUTLET PIPE TRAINING WALL, DIAGONAL CRACK NOW HELD IN PLACE BY STEEL BARS BOLTED TO CONCRETE SEEPAGE ALONG WALL SEE 9.e., SPILLWAY CHANNEL PAVING - IN POOL CONDITION, GETS WORSE DOWN TOWARD TOE, SEE 7.d., IN GENERAL PAVEMENT IS BADLY CRACKED & DETERIORATED.

~~c. Condition of Auxiliary Spillway~~

c. CONDITION OF AUXILIARY SPILLWAY - N/A.

d. Condition of Discharge Channel BADLY CRACKED & DETERIORATED TO AS DEEP AS 1'. CRACKING MAY BE CAUSED BY DIFFERENTIAL HEAVE DUE TO FROST ACTION. ESPECIALLY BAD DETERIORATION OF MIDDLE SECTION OF SPILLWAY DISCHARGE CHANNEL FOR 5' WIDTH FROM ½ OF CHANNEL.

8. RESERVOIR DRAIN/OUTLET

a. Type: Pipe ✓ Conduit _____ Other _____

b. Material: Concrete _____ Metal ✓ Other _____

c. Size: 48" Length _____ } SEE H+H DATA CHECKLIST APPENDIX C

d. Invert Elevations: Entrance _____ Exit _____ }

e. Physical Condition (Describe)

Unobservable _____

1) Material CAST IRON PIPE

2) Joints LEADED JOINTS W/ HEMP OR JUTE GASKETS, CONC. COLLARS UNREINFORCED AT JOINTS Alignment OKAY

3) Structural Integrity - MINERAL DEPOSITS AT JOINTS, SOME SEEPAGE AT JOINTS, PIPE RUSTING & METAL AS THICK AS ¼" FLAKING OFF

4) Hydraulic Capability GOOD, TAILWATER IN PIPE IS DEEP AS 1' DUE TO CONFIGURATION OF OUTLET CHANNEL

f. Means of Control: Gate ____ Valve ✓ Uncontrolled ____

Operation: Operable ✓ Inoperable ____ Other _____

Present Condition (Describe) VALVE ITSELF IS RUSTED, DOUBLE HAND CRANK BEVEL GEAR FLOOR STAND IS OPERATING MECHANISM WHICH IS PROTECTED BY GATE HOUSE, WELL LUBRICATED, OPERABLE & IN VERY GOOD CONDITION

g. Other Outlets (water mains, diversion pipes) _____

NONE

9. STRUCTURAL

a. Concrete Surfaces SCALING AT TOPS OF TRAINING WALLS, EFFLORESCENCE & STAINING OF ALL WALLS, DETERIORATION OF SPILLWAY CHANNEL PAVEMENT SPALLING AT VERTICAL CONSTRUCTION JOINTS & HORIZONTAL FOUR JOINTS

b. Structural Cracking 14 CRACKS ON LEFT + 15 CRACKS ON RIGHT TRAINING WALL. TRANING WALL AT OUTLET CONDUIT DISCHARGE CHANNEL & SPILLWAY DISCHARGE CHANNEL INTERSECTION HAS 2" DIAGONAL & VERTICAL CRACK CAUSING CORNER TO FALL OFF. PRESENTLY HELD IN PLACE BY 2" STEEL BRACES BOLTED TO REMAINDER OF WALL.

c. Movement - Horizontal & Vertical Alignment(Settlement) RIGHT TRAINING WALL OF SPILLWAY FROM STA 3+00 TO 5+15 END TILTS INTO SPILLWAY DISCHARGE CHANNEL 5° TO 10° FROM VERTICAL. THIS IS PROBABLY DUE TO EARTH PRESSURE AND FROST ACTION. TILTING IS VERY MINOR ON LEFT TRAINING WALL OF SPILLWAY.

GEI d. Junctions with Abutments or Embankments
Good condition

GEI e. Drains - Foundation, Joint, Face Two holes are drains near bottom of upstream (right) wall of spillway discharge channel. Seepage occurs at all construction joints in this channel to the right of Sta ~4+50.

f. Water Passages, Conduits, Sluices
OUTLET CONDUIT PREVIOUSLY DISCUSSED IS ONLY ONE.

GEI g. Seepage or Leakage
See (e) above

h. Joints - Construction, etc. SPALLING & DETERIORATION AT MANY CONSTRUCTION JOINTS

GEI i. Foundation Foundation is glacial till. Soft soils over till were excavated prior to construction of embankment, according to plans.

GEI j. Abutments Same as (i) above.

k. Control Gates NONE

l. Approach & Outlet Channels APPROACH CHANNEL - CLOGGED WITH 6' HIGH BRUSH GROWTH, OUTLET CHANNEL - D/S OF OUTLET CONDUIT DISCHARGE CHANNEL & SPILLWAY DISCHARGE CHANNEL INTERSECTION THE CHANNEL IS PAVED W/ STONE & IS CLEAR OF DEBRIS, BOX CULVERT IN VICINITY OF CATSKILL AQUEDUCT RESTRICTS CHANNEL CAPACITY

m. Energy Dissipators (Plunge Pool, etc.) NONE

n. Intake Structures NOT OBSERVABLE, UNDERWATER.

o. Stability

p. Miscellaneous N/A

8876 Name of Dam Silver Stream Reservoir Dam Date Apr. 9, 81 9

10. APPURTENANT STRUCTURES (Power House, Lock, Gatehouse, Service Bridge, Other)

a. Description:

GATE HOUSE - BRICK STRUCTURE W/ WOOD FRAME SLATE SHINGLE ROOF SET ON CONCRETE CONTROL TOWER, DOMINATES LOCK.

SERVICE BRIDGE - I-BEAM SUPPORTED WOODEN GRID DECK W/ PIPE RAILINGS

DAM ACCESS BRIDGE - CONCRETE BRIDGE OVER SPILLWAY @ DAM

b. Condition:

GATE HOUSE - GOOD CONDITION.

SERVICE BRIDGE - GOOD CONDITION FOR PEDESTRIAN TRAFFIC.

DAM ACCESS BRIDGE - GOOD CONDITION, RESTRICTS HIGH SPILLWAY FLOWS.

11. MISCELLANEOUS MECHANICAL/ELECTRICAL EQUIPMENT

a. Description: N/A

b. Condition:

12. OTHER DIKE - SEE SEPARATE CHECKLIST.

PHASE I

VISUAL INSPECTION CHECKLIST

1. BASIC DATA

a. General

Name of Dam Left (West) Concrete and Earth Dike Silver Stream Reservoir Dam

Fed. I.D.# _____ DEC Dam No. _____

River Basin LOWER HUDSON

Location: Town NEW WINDSOR County ORANGE

Stream Name SILVER STREAM

Tributary of MOODNA CREEK

Latitude (N) 41° 28.7' Longitude (W) 74 5.4'

Type of Dam CONCRETE GRAVITY + EARTH DIKE

Hazard Classification HIGH

Date(s) of Inspection APRIL 9, 1981

Weather Conditions COOL + CLOUDY W/ RAIN STARTING @ 12AM

Reservoir Level at Time of Inspection EL 258
(5' BELOW SPILLWAY CREST OF ADJACENT DAM)

b. Inspection Personnel (*Recorder) THOMAS BENNEDUM - CTM,
EDWIN VOPELAK JR.* - CTM, STEVE J. POULOS - GET

c. Persons Contacted (Including Title, Address & Phone No.)

JAMES W. BROWN, WATER SUPERINTENDANT
NEWBURGH WATER DEPT., 79 DUBOIS ST., NEWBURGH, N.Y. 12550
(914) 565-3356

d. History
Date Constructed 1923 Date(s) Reconstructed N/A

Designer FULLER + HARDING CONSULTING ENGR. (FULLER + MCCLINTOCK)
(NO LONGER IN BUSINESS)

Constructed By UNKNOWN

Owner CITY OF NEWBURGH, CITY HALL, 83 BROADWAY, NEWBURGH,
N.Y. 12550, ATTN: GARY J. BLOOMQUIST, CITY MANAGER, (914) 565-3333

1568 Name of Dam Silver Stream Reservoir Dam Date Apr 9, 81 2

Left (West) Dike

2. EMBANKMENT

a. Characteristics

GEI 1) Embankment Material Embankments to left and right of concrete gravity section probably till.

GEI 2) Cutoff Type Concrete, unreinforced, ~4 ft, or more into natural till. About 3ft thick, according to drawings. In concrete gravity portion, depth only 3 ft into orig. grd.

GEI 3) Impervious Core Concrete, unreinforced, 18 in. thick at top, 3 ft thick at bottom, acding to drawings.

GEI 4) Internal Drainage System None

GEI 5) Miscellaneous

GEI b. Crest

GEI 1) Vertical Alignment Satisfactory

GEI 2) Horizontal Alignment Satisfactory

GEI 3) Lateral Movement None observed

GEI 4) Surface Cracks Embankment - none
Concrete gravity - see structural

GEI 5) Miscellaneous Embankment covered with brush to 6 ft high to left of concrete. Rt emb. is grassed.

GEI c. Upstream Slope

GEI 1) Slope (Estimate H:V) 2½ H:1 V

GEI 2) Undesirable Growth or Debris, Animal Burrows
Brush to 6 ft high along normal pool level, left and right of concrete gravity portion.

GEI 3) Sloughing, Subsidence or Depressions None.

Rt~~g~~ Left (West) Dike

GEI 4) Slope Protection Riprap laid on edge. Good condition. Same as dam.

GEI 5) Surface Cracks or Movement at Toe

Toe not visible. No cracks observed.

GEI d. Downstream Slope

GEI 1) Slope (Estimate - H:V) 2H:1V

GEI 2) Undesirable Growth or Debris, Animal Burrows

Animal holes @ Sta 4+30, 4+40, 4+50, 4+75 1 to 3 ft down from crest. Brush to 12 ft high on left emb. Slash discarded at left end.

GEI 3) Sloughing, Subsidence or Depressions

None

GEI 4) Surface Cracks or Movement at Toe

None

GEI 5) Seepage No seeps visible from embankments. On downstream side of concrete, seeps at Sta 1+75 (2gpm); 2+08 (5-10 gpm); 3+35 (5-10 gpm) Water downstream only 2 ft lower than upstream.

GEI 6) External Drainage System (Ditches, Trenches, Blanket)

No outlet for seepage was found. Owner stated that a pipe drains swampy zone ds from concrete into blowoff channel of main dam.

GEI 7) Condition Around Outlet Structure

None.

GEI 8) Seepage Beyond Toe None observable. Entire zone downstream from concrete is ponded or swampy.

GEI e. Abutments - Embankment Contact

Good

4586 Name of Dam Silver Stream Reservoir Dam Date Apr 9, 1981 4
Left (West) Dike

GEI 1) Erosion at Contact None

GEI 2) Seepage Along Contact None

3. DRAINAGE SYSTEM

GEI a. Description of System None

GEI b. Condition of System N.A.

GEI c. Discharge from Drainage System N.A.

4. INSTRUMENTATION (Monumentation/Surveys, Observation Wells,
GEI Weirs, Piezometers, Etc.)

None

5. RESERVOIR

GEI a. Slopes See Dam

GEI b. Sedimentation

GEI c. Unusual Conditions Which Affect Dam

1285 Name of Dam Silver Stream Reservoir Dam Date Apr. 9, 1981 5

6. AREA DOWNSTREAM OF DAM

a. Downstream Hazard (No. of Homes, Highways, etc.) SEE DAM

GEI b. Seepage, Growth Swampy, ponded water, swamp grass 4ft high.

GEI c. Evidence of Movement Beyond Toe of Dam None

d. Condition of Downstream Channel NO CHANNEL DS.

7. SPILLWAY(S) (Including Discharge Channel)

a. General NONE

b. Conditon of Service Spillway N/A

c. Condition of Auxiliary Spillway N/A

Left (West) Dike

d. Condition of Discharge Channel NONE

8. RESERVOIR DRAIN/OUTLET - NONE

a. Type: Pipe_____ Conduit _____ Other _____

b. Material: Concrete _____ Metal_____ Other _____

c. Size: _____ Length_____

d. Invert Elevations: Entrance_____Exit_____

e. Physical Condition (Describe)

Unobservable _____

1) Material _____

2) Joints _____Alignment _____

3) Structural Integrity _____

4) Hydraulic Capability_____

f. Means of Control: Gate____ Valve____ Uncontrolled___

Operation: Operable ___ Inoperable ___ Other _____

Present Condition (Describe)_____

g. Other Outlets (water mains, diversion pipes) _____

NONE

0920 Name of Dam Silver Stream Reservoir Dam Left (West) Dike Date Apr 9, 1981 7

9. STRUCTURAL

a. Concrete Surfaces - EFFLORESCENCE + SOME SLIGHT SURFACE DETERIORATION SPALLING AT VERTICAL CONSTRUCTION JOINTS AND HORIZONTAL CONCRETE POUR JOINTS, SOME CONCRETE PATCHING DONE ON DAM, MOSTLY U/S SIDE BUT THIS IS SPALLING OFF TOO, LARGE PIECE OF CONC. NEAR CREST AT STA 4+00 (15 CF) ABOUT TO SPALL OFF.

b. Structural Cracking SEPARATION/CRACKING AT HORIZONTAL CONCRETE POUR JOINTS

c. Movement - Horizontal & Vertical Alignment(Settlement) APPEARS OKAY.

GEI d. Junctions with Abutments or Embankments Good

GEI e. Drains - Foundation, Joint, Face None

f. Water Passages, Conduits, Sluices NONE

GEI g. Seepage or Leakage Noted at 2(d) 5 on p. 3

0798 Name of Dam Silver Stream Reservoir Dam Date Apr 9, 81 8

h. Joints - Construction, etc. Left (West) Dike SPALLING AT CONSTRUCTION JOINTS AS WELL AS SEEPAGE (SEE 2(d)5 ON P. 3)

GEI i. Foundation According to plans and specs, muck excavated up to 20 ft deep to reach glacial till. Embankment and concrete placed on till.

GEI j. Abutments Glacial till. See (i) above.

k. Control Gates NONE

l. Approach & Outlet Channels N/A

m. Energy Dissipators (Plunge Pool, etc.) NONE

n. Intake Structures NONE

o. Stability

p. Miscellaneous N/A

8876 Name of Dam Silver Stream Reservoir Dam Date Apr. 9, 81 9
Left (West) Dike

10. APPURTENANT STRUCTURES (Power House, Lock, Gatehouse, Service Bridge, Other)

a. Description:

CONCRETE PUMP PIT ON D/S SIDE OF DIKE - NOW ABANDONED. ORIGINALLY INSTALLED TO DRAIN WET AREA ON D/S SIDE OF DIKE, A GRAVITY DRAINAGE SYSTEM DRAINING TO SILVER STREAM D/S OF DAM WAS INSTALLED IN 1940's & REPLACED THE USE OF THIS PUMP PIT.

b. Condition:

11. MISCELLANEOUS MECHANICAL/ELECTRICAL EQUIPMENT

a. Description: N/A

b. Condition:

12. OTHER

APPENDIX C

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

CHECKLIST AND COMPUTATIONS

TABLE OF CONTENTS

4595

PHASE I INSPECTION

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA CHECKLIST

Name of Dam SILVER STREAM RESERVOIR DAM Fed. Id.# NY00511

1. AREA-CAPACITY DATA

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
a. Top of ~~Dam~~ DIKE	366.5	227 EST.	2,464
b. Design High Water (Max. Design Pool)	UNKNOWN		
c. Auxiliary Spillway Crest	N/A		
d. Pool Level with Flashboards	N/A		
e. Service Spillway Crest	363	198.2	1,538
f. TOP OF DAM	368	239 EST.	2,860 EST.

2. DISCHARGES

	Volume (cfs)
a. Average Daily	UNKNOWN
b. Spillway @ Top of ~~Dam~~ DIKE	590
c. Spillway @ Design High Water	UNKNOWN
d. Service Spillway @ Auxiliary Spillway Crest Elevation	N/A
e. Low Level Outlet w/ w.s. @ TOP OF DIKE	260
f. Total (of all facilities) @ Top of ~~Dam~~ DIKE	850
g. Maximum Known Flood	UNKNOWN
h. At Time of Inspection	0

4596

3. TOP OF DAM

Elevation 368

a. Type EARTH FILL W/ CONC. CORE WALL

b. Width 15' Length DAM 557' (W/ SPILLWAY)

c. Spillover SERVICE SPILLWAY

d. Location AT LEFT ABUTMENT LOOKING D/S

4. SPILLWAY

	SERVICE		AUXILIARY
a.	363 (FROM 1956 USGS QUAD)	Elevation	NONE
b.	CHUTE W/ CONC. BRIDGE DECK ACROSS TOP	Type	
c.	30'	Width	
		Type of Control	
d.	✓	Uncontrolled	
		Controlled:	
c.		Type (Flashboards; gate)	
f.		Number	
g.		Size/Length	
h.	CONCRETE PAVING	Invert Material	
i.		Anticipated Length of Operating Service	
j.	~225'	Chute Length	
k.	~ 0'	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	
l.		Other	

4597

5. OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES

a. Type: Gate____ Sluice____ Conduit ✓ Penstock____

b. Shape CAST IRON PIPE W/ GATE VALVE ON U/S END

c. Size 48" DIA , ~104' LONG

d. Elevations: Entrance Invert ~ 345.6

Exit Invert 345.6

e. Tailrace Channel: Elevation ~ 345

6. FLOOD WATER CONTROL SYSTEM

a. Warning System NONE KNOWN

b. Method of Controled Releases (mechanisms) OPERATION OF 48" OUTLET PIPE TO RELEASE FLOWS TO D/S DIVERSION DAM ON SILVER STREAM WHICH CONTROLS INFLOW INTO LAKE WASHINGTON.

7. CLIMATOLOGICAL GAGES

a. Type NON-RECORDING PRECIPITATION GAGE

b. Location AT WATER TREATMENT PLANT (ABOUT 1.5 MILES FROM DAM)

c. Period of Record ABOUT 1950 TO PRESENT

d. Maximum Reading UNKNOWN Date____

8. STREAM GAGES REFERENCE 23.

a. Type SURFACE WATER STATION USGS GAGE # 01371500

b. Location WALLKILL RIVER AT GARDINER (REGULATED)

LAT. 41° 41' 10" LONG. 74° 09' 56" ; 16 MILES SOUTH OF DAM

c. Period of Record 1924 - PRESENT

D.A. = 711 SQ. MI.

d. Maximum Reading 30,800 cfs = 43.3 cms Date OCT. 16, 1955

9. OTHER

6169

10. DRAINAGE BASIN CHARACTERISTICS

a. Drainage Area 1.887 SQ. MI. OR 1207.8 ACRES

b. Land Use - Type WOODED AREAS, FARMLAND

c. Terrain - Relief SLOPES < 10% ELEVATIONS FROM EL 363 TO EL 540

d. Surface - Soil GLACIAL TILL (?)

e. Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

NONE KNOWN

f. Potential Sedimentation Problem Areas (natural or man-made; present or future)

NONE KNOWN

g. Potential Backwater Problem Areas for Levels at Maximum Storage Capacity (including surcharge storage)

PORTION OF MT. AIRY ROAD AND ITS VICINITY AT EXTREME SOUTHERN END OF RESERVOIR AT ABOUT EL 375± (EST.)

h. Dikes - Floodwalls (overflow & non-overflow) - Low Reaches Along the Reservoir perimeter

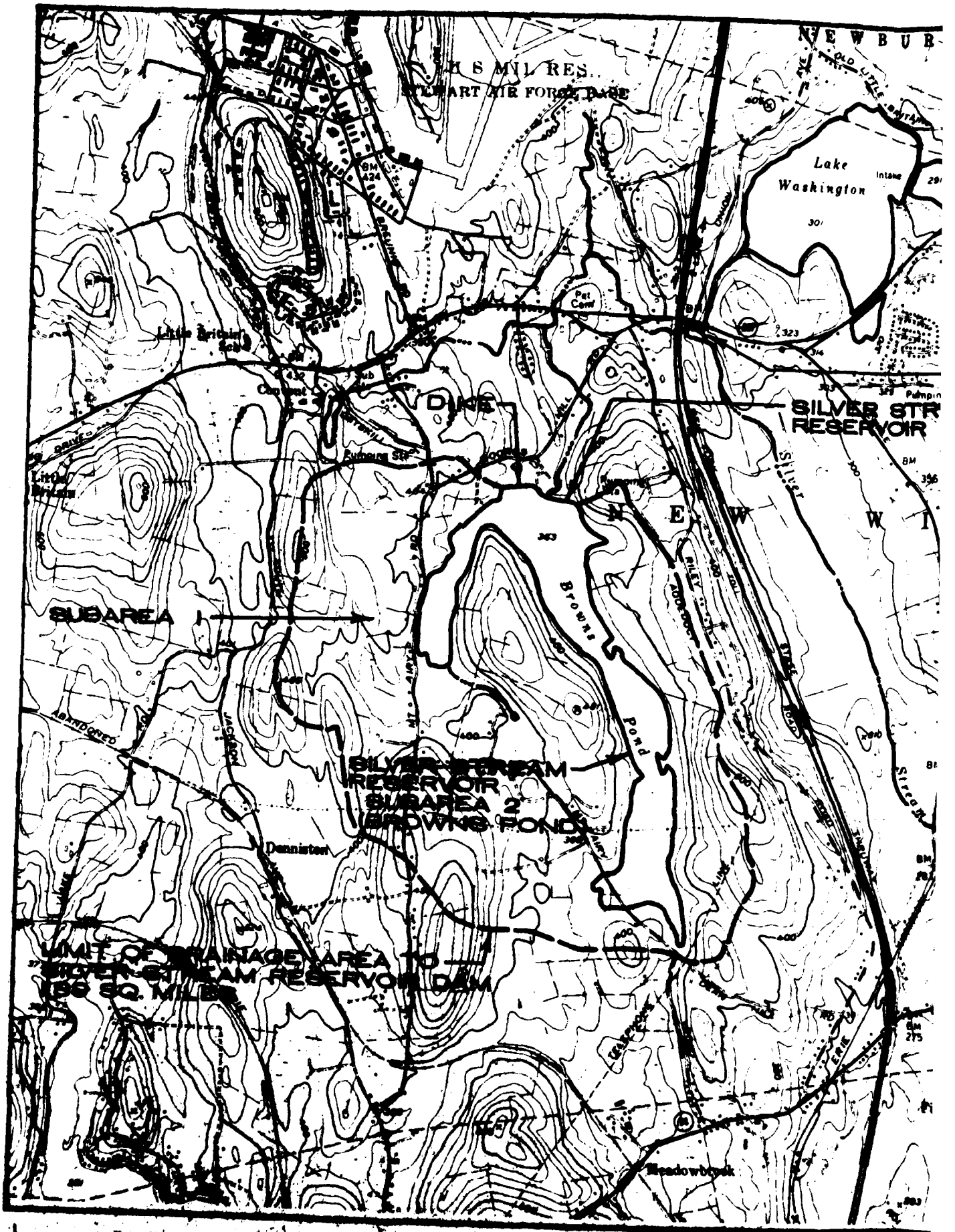
Location DIKE 100' WEST OF SPILLWAY, 695' LONG (314' CONC., 381' EARTH)

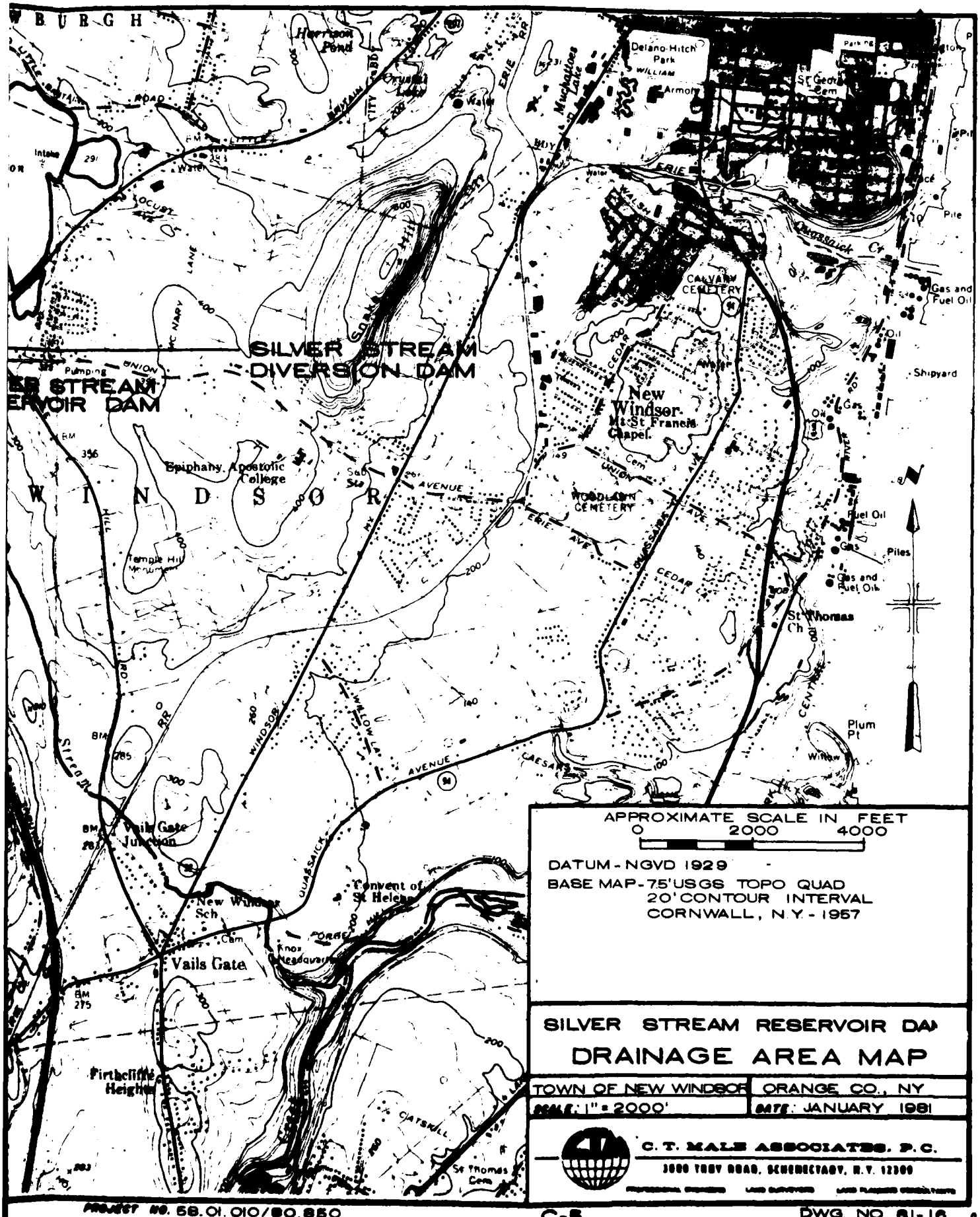
Elevation CONC. PORTION 366.5, EARTH PORTION 368

i. Reservoir

Length @ Maximum Design Pool ~8000' (AT SPILLWAY CREST) (feet)

Length of Shoreline (@ Service Spillway Crest) ~28,000 (feet)


U.S. MIL RES.
STEWART AIR FORCE BASE
NEWBUR
Lake
Washington
Little Britain
DIKE
SILVER STR
RESERVOIR
SUBAREA 1
Browns
Pond
SILVER STREAM
RESERVOIR
SUBAREA 2
BROWNS POND
Dennistown
LIMIT OF DRAINAGE AREA TO
SILVER STREAM RESERVOIR DAM
90 SQ. MILES
Meadowbrook



APPROXIMATE SCALE IN FEET
0 2000 4000

DATUM - NGVD 1929

BASE MAP - 7.5' USGS TOPO QUAD
20' CONTOUR INTERVAL
CORNWALL, N.Y. - 1957

SILVER STREAM RESERVOIR DAM
DRAINAGE AREA MAP

TOWN OF NEW WINDSOR	ORANGE CO., NY
SCALE: 1" = 2000'	DATE: JANUARY 1981

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COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB SILVER STREAM RESERVOIR DAM
SHEET NO _____ OF _____
CALCULATED BY CLV DATE 4/13/81
CHECKED BY _____ DATE _____
SCALE 58.01,00010

ELEVATION - AREA - STORAGE COMPUTATIONS

RESERVOIR VOLUME: FOR STORAGE ABOVE SPILLWAY CREST VOLUME COMPUTED BY METHOD OF CONIC SECTIONS $\Delta V_{12} = h/3\,(A_1 + A_2 + \sqrt{A_1 A_2})$

	ELEVATION (NGVD - ft.) *	AREA (acres) ***	VOLUME (acre-feet)
	345.6	–	0
SPILLWAY CREST	363	198.2	1538 **
TOP OF DIKE	366.5	227 } EST.	2464 (FROM COMPUTER)
TOP OF DAM	368	239 }	2860 (ESTIMATE)
	380	336.8	6034

* CONSTRUCTION DRAWING ELEVATION BASE IS APPROXIMATELY 1.5' LOWER THAN NGVD.

** IMPOUNDING CAPACITY AT SPILLWAY CREST FROM CONSTRUCTION APPLICATION DATED 7/2/23. (SEE APPENDIX F3-42)

*** FROM USGS TOPOGRAPHIC MAPPING.

DRAINAGE AREA

	AREA (square miles)	AREA (acres)
WATERSHED DIRECT TO RESERVOIR (SUBAREA 1)	1.577	1009.6
RESERVOIR SURFACE (SUBAREA 2) @ SPILLWAY CREST EL = 363	0.310	198.2
TOTAL	1.887	1207.8

FORM CTM-105

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JOB SILVER STREAM RESERVOIR DA
SHEET NO. ____ OF ____
CALCULATED BY CLV DATE 4/13/81
CHECKED BY ____ DATE ____
SCALE 58.01.00010

DRAINAGE AREA DATA FOR HEC-1 DB MODEL

SUBAREA 1: AREA TRIBUTARY DIRECTLY TO RESERVOIR
AREA = 1.577 SQUARE MILES

LOSS RATES: 1.0" - INITIALLY
0.1"/HOUR - CONSTANT LOSS RATE

UNIT HYDROGRAPH PARAMETERS: USE SNYDER METHOD

A = DRAINAGE AREA = 1.577 SQUARE MILES
L = LENGTH OF MAIN WATERCOURSE TO UPSTREAM LIMIT OF DRAINAGE AREA = 1.04 MILES
L_{CA} = LENGTH ALONG MAIN WATERCOURSE TO POINT OPPOSITE THE CENTROID OF THE DRAINAGE AREA = .28 MILES
C_t = SNYDER'S BASIN COEFFICIENT = 1.47 (FROM REF. 20)
C_p = SNYDER'S PEAKING COEFFICIENT = .686 (FROM REF. 20)
t_p = STANDARD LAG IN HOURS = $C_t(LL_{CA})^{0.3}$ = 1.01 HOURS

∴ USE t_p = 1.0 HOURS

REQUIRED UNIT RAINFALL DURATION = t_r
$t_r = \frac{t_p}{5.5} = \frac{1.01}{5.5} = 0.18$ hr ≈ 11 min max
USE t_r = 10 min < 10.4 min OK

SUBAREA 2: RESERVOIR SURFACE, AREA = .310 SQ. MILES = 198.2 ACRES

LOSS RATES: NONE BECAUSE RAINFALL ≈ RUNOFF FOR WATER SURFACE

UNIT HYDROGRAPH PARAMETERS:

FOR U.H. W/ 10 MINUTE DURATION + 1" RAIN

$$\bar{Q} = \frac{A(1")}{t} = \frac{198.2 \text{ acres } (1")}{10 \text{ minutes}} \left(\frac{43{,}560 \text{ sq FT}}{1 \text{ acre}}\right)\left(\frac{1 \text{ FT}}{12 \text{ inches}}\right)\left(\frac{1 \text{ minute}}{60 \text{ seconds}}\right)$$

$\bar{Q}$ = 1,199 cfs (W/O LOSS RATE)

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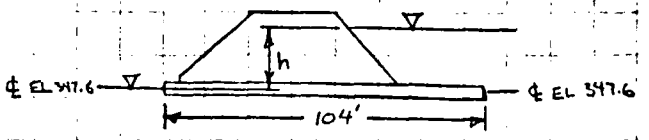
JOB SILVER STREAM RESERVOIR DAM
SHEET NO. ____ OF ____
CALCULATED BY CLV DATE 4/15/81
CHECKED BY ____ DATE ____
SCALE 58.01.00010

DISCHARGE COMPUTATIONS

OUTLET PIPE CAPACITY



DAM HAS ONE 48" CAST IRON OUTLET PIPE W/ UPSTREAM CONTROL GATE IN GATE HOUSE. GATE IS OPERATED BY WATER DEPARTMENT AS NECESSARY TO CONTROL RESERVOIR OUTFLOW AND STORAGE LEVELS.

$Q = .6 A \sqrt{2gh}$ FORMULA FOR ORIFICE FLOW (INLET CONTROL W/ FREE DISCHARGE), REF. 9

$A = \pi r^2 = \pi (2')^2 = 12.57$ SQ. FT. LENGTH OF PIPE ≈ 104'

PIPE SLOPE ≈ FLAT W/ INVERT @ EL 345.6, ℄ @ EL 347.6

	ELEVATION (NGVD)	h (feet)	$Q_{OUTLET\ PIPE}$ (cfs)	$Q_{OUTLET\ PIPE}$ * (cfs) OUTLET CONTROL
SPILLWAY CREST	363	15.4	238	268
	364	16.4	245	
	365	17.4	252	
	366	18.4	260	
TOP OF DIKE	366.5	18.9	263	297
	367	19.4	267	
TOP OF DAM	368	20.4	273	
	369	21.4	280	
	370	22.4	286	323

* FOR OUTLET CONTROL: (DERIVED FROM APPLICATION OF BERNOULLI'S EQUATION USING MANNING'S EQUATION FOR FRICTION LOSS)

$$Q = \left[\frac{S_{w.s.}}{\frac{k_{en} + k_{ex}}{2gA^2} L + \frac{n^2}{2.21 A^2 R^{4/3}}} \right]^{1/2}$$

$A = \pi r^2$ $P = 2\pi r$ $L = 104'$

$A = 12.57$ $P = 12.57$ k_{en} ASSUMED TO BE 0.5

$R = \frac{A}{P} = 1$ $S = \frac{h}{L}$ k_{ex} ASSUMED TO BE 1.0

$n = .015$ FOR OLD C.I.P.

CHECK FOR OUTLET CONTROL SHOWS PIPE IS INLET CONTROLLED.

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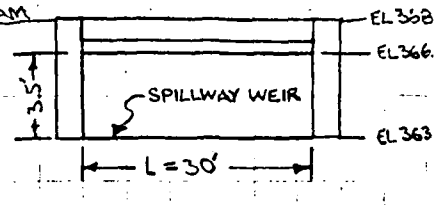
JOB SILVER STREAM RESERVOIR DAM
SHEET NO ____ OF ____
CALCULATED BY CLV DATE 4/13/81
CHECKED BY ____ DATE ____
SCALE 58.01.00010

DISCHARGE COMPUTATIONS

SERVICE SPILLWAY CAPACITY

U/S VIEW SPILLWAY CONTROL SECTION

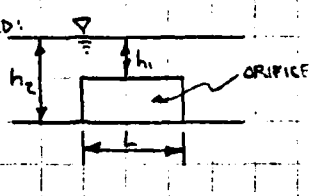


FOR FLOW 0' ≤ 3.5' DEEP WEIR FLOW ASSUMED:

$$Q = 3.087\,(L - 0.2H)H^{1.5}$$ (REFERENCE 8)

WHERE: L = LENGTH, 0.2H = END LOSSES, & BROAD-CRESTED RECTANGULAR WEIR $k_a \approx 0.1$ BECAUSE OF TAPERED APPROACH CHANNEL.

FOR FLOW 3.5' TO 5' DEEP ORIFICE FLOW (W/ FREE DISCHARGE) ASSUMED:



$$Q = \frac{2}{3} L C \sqrt{2g}\,(h_2^{3/2} - h_1^{3/2})$$ (REFERENCE 8)

WHERE: C = ORIFICE COEF. = 0.6

FOR FLOW > 5' ORIFICE FLOW & WEIR FLOW (OVER DAM ACCESS BRIDGE ACROSS SPILLWAY) ASSUMED:

$$Q = 3.087\,LH^{1.5}$$ IDEAL BROAD-CRESTED WEIR FLOW W/O END LOSSES (REFERENCE 9) WHERE H MEASURED FROM TOP OF DAM

FOR ORIFICE FLOW USE SAME EQUATION AS ABOVE.

	ELEVATION (NGVD - ft.)	$H+h_2$ (ft)	WEIR Q W/ END LOSSES (cfs)	ORIFICE Q (cfs)	WEIR Q W/O END LOSSES FLOW OVER ACCESS BRIDGE (cfs)	TOTAL SPILLWAY Q (cfs)	
SPILLWAY CREST	363	0	0	—	—	0	
	364	1	92	—	—	92	
	365	2	258	—	—	258	
	366	3	472	—	—	472	
TOP OF DIKE	366.5	3.5	592	631	—	592	SAY 590
	367	4	—	736	—	736	
TOP OF DAM	368	5	—	900	0	900	
	369	6	—	1,035	93	1,128	
	370	7	—	1153	262	1,415	

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JOB SILVER STREAM RESERVOIR DAM
SHEET NO ____ OF ____
CALCULATED BY ELV DATE 4/13/81
CHECKED BY ____ DATE ____
SCALE 58.01.00010

DISCHARGE COMPUTATIONS

DAM APPURTENANCE	ELEVATION (NGVD)	SIZE
SERVICE SPILLWAY	CREST EL. = 363	30' WIDE W/ 3.5' HIGH CLEAR OPENING
DAM *	CREST EL. = 368 (LEVEL)	527' CREST LENGTH (EXCLUDING SPILLWAY)
DIKE (CONC. + EARTH PORTIONS)	CREST EL. = 366.5	314' CREST LENGTH
	CREST EL. = 368 (LEVEL)	381' CREST LENGTH
OUTLET PIPE	INVERT EL. = 345.6	48" DIA C I P

* FOR FLOW OVER DAM + DIKE: CALCULATED W/ HEC-1 DB PROGRAM FOR FLOW OVER NON-LEVEL CREST.

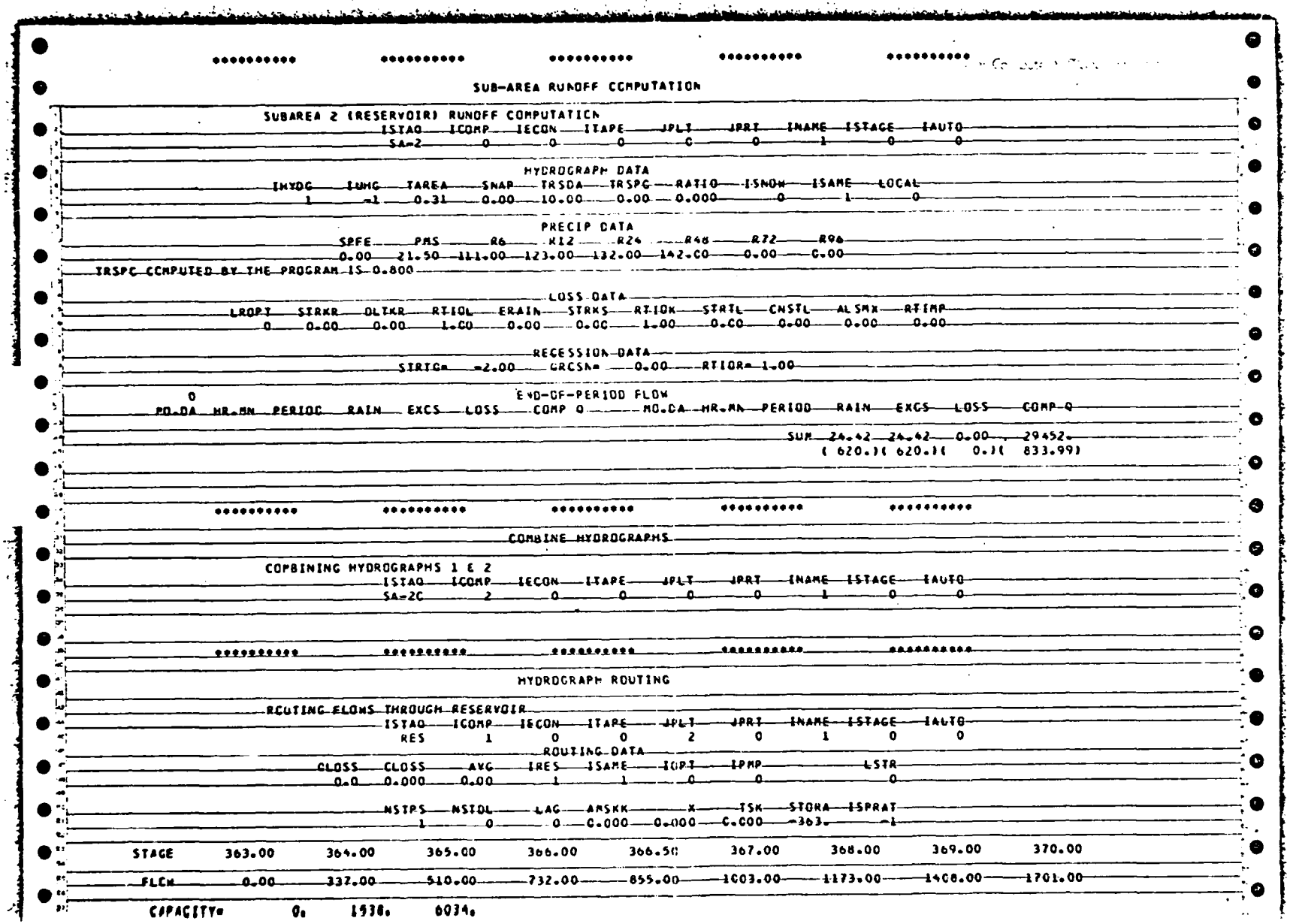
	ELEVATION (NGVD)	$H_{SPILLWAY}$ (feet)	H_{DIKE} (feet)	$Q_{SPILLWAY}$ (cfs)	$Q_{OUTLET\ PIPE}$ (cfs) **	$Q_{DAM+DIKE}$ (cfs)	Q_{TOTAL} (cfs)	Q_{INPUT} (cfs)
SPILLWAY CREST	363	0	0	0	0	0	0	0
	364	1	0	92	245	0	337	337
	365	2	0	258	252	0	510	510
	366	3	0	472	260	0	732	732
TOP OF DIKE	366.5	3.5	0	592	263	0	855	855 (SAV BSC
	367	4	.5	736	267	343	1,346	1,003
TOP OF DAM	368	5	1.5	900	273	1,782	2,955	1,173
	369	6	2.5	1128	280	6639	8,047	1,408
	370	7	3.5	1415	286	14,284	15,985	1,701

** OUTLET PIPE IS OPEN OR CLOSED DEPENDING ON WATER SYSTEM REQUIREMENTS. THIS DATA IS FOR OUTLET PIPE OPENED FULL WHEN W.S. AT EL 364 (1' OF FLOW IN SPILLWAY).

```
A NYD DAM INSPECTION: DAC-51-81-C-0014
A NY30511. SILVER STREAM RESERVOIR DAM. 58.01.00010/80.00850
A OVERTOPPING ANALYSIS SSR02
B    288       0      10                                                  A
B1     5
J      1       2       1
J1   1.0     0.5
K      0    SA-1                                          1
K1 SUBAREA 1 RUNOFF COMPUTATION
M      1       1   1.277                10                                1
P             21.5     111     123     132     142
T                                                  1.0     .10
U      1
U1  1.686
X     -2                1
K      0    SA-2                                      1
K1 SUBAREA 2 (RESERVOIR) RUNOFF COMPUTATION
M      1      -1    .310                10                                1
P             21.5     111     123     132     142
T                                                  0       0
U      1
U1  1199
X     -2                1
K      2   SA-2C                                      1
K1 COMBINING HYDROGRAPHS 1 & 2
K      1     RES                       2              1
K1 ROUTING FLOWS THROUGH RESERVOIR
Y                                      1       1
Y1     1                                                  -363     -1
Y4   363     364     365     366   366.5     367     368     369     370
Y5     0     357     510     732     855    1003    1173    1408    1701
SS     0    1538    6034
SE 345.6     363     380
SA   363
SQ 366.5
SL   314     314    1222
SV 366.5  367.99     368
K     99
A
A
A
A
A
```

C-11

```
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79

**********

RUN  DATE: 8/07/81
     TIME: 7:37 AM


NYD DAM INSPECTION: DACW51-81-C-0014
NY00511, SILVER STREAM RESERVOIR DAM, 58-01-0010/80-00850
OVERTOPPING ANALYSIS SSRD2

                                    JOB SPECIFICATION
      NQ     NHR    NMIN    IDAY    IHR    IMIN   METRC    IPLT    IPRT   NSTAN
     288       0      10       0      0       0       0       0       4       0
                                  JOPER     NRT   LROPT   TRACE
                                      5       0       0       0


                                MULTI-PLAN ANALYSES TO BE PERFORMED
                                    NPLAN= 1 NRTIO= 2 LRTIO= 1
                RTIOS=   1.00   0.50


**********      **********      **********      **********      **********

                                SUB-AREA RUNOFF COMPUTATION

                SUBAREA 1 RUNOFF COMPUTATION
                                ISTAQ   ICOMP   IECON   ITAPE   JPLT    JPRT    INAME   ISTAGE  IAUTO
                                SA-1        0       0       0       0       0       1       0       0
                                                HYDROGRAPH DATA
                IHYDG   IUHG    TAREA   SNAP    TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
                    1       1    1.58    0.00   10.00    0.00   0.000       0       1       0
                                                PRECIP DATA
                                SPEE    PMS     R6      R12     R24     R48     R72     R96
                                0.00   21.50  111.00  123.00  132.00  142.00    0.00    0.00
IRSPC COMPUTED BY THE PROGRAM IS 0.800
                                                LOSS DATA
                LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
                    0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.00
                                            UNIT HYDROGRAPH DATA
                                    TP=  1.00    CP=0.69    NTA=  0
                                            RECESSION DATA
                                STRTQ=   -2.00    QRCSN=    0.00    RTIOR= 1.00

        UNIT HYDROGRAPH 28 END-OF-PERIOD ORDINATES, LAG=  1.00 HOURS, CP= 0.68  VOL= 1.00
          46.     167.     327.     495.     631.     700.     693.     603.     484.     388.
         311.     249.     200.     160.     129.     103.      83.      66.      53.      43.
          34.      27.      22.      18.      14.      11.       9.       7.
   0
                                        END-OF-PERIOD FLOW
 MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q
```



SUB-AREA RUNOFF COMPUTATION

SUBAREA 2 (RESERVOIR) RUNOFF COMPUTATION

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SA-2	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	0.31	0.00	10.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	123.00	132.00	142.00	0.00	0.00

IRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

RECESSION DATA

STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	24.42	24.42	0.00	29452.
										(620.)(	620.)(	0.)(	833.99)

COMBINE HYDROGRAPHS

COMBINING HYDROGRAPHS 1 & 2

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SA-2C	2	0	0	0	0	1	0	0

HYDROGRAPH ROUTING

ROUTING FLOWS THROUGH RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RES	1	0	0	2	0	1	0	0

ROUTING DATA

CLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-363.	-1

STAGE	363.00	364.00	365.00	366.00	366.50	367.00	368.00	369.00	370.00
FLOW	0.00	332.00	510.00	732.00	855.00	1003.00	1173.00	1408.00	1701.00

CAPACITY= 0. 1538. 6034.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
363.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	CCOD	EXPD	DAMWID
366.5	C.0	0.0	0.

CREST LENGTH	314.	314.	1222.
AT OR BELOW			
ELEVATION	366.5	368.0	368.0

PEAK OUTFLOW IS 2860. AT TIME 42.17 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

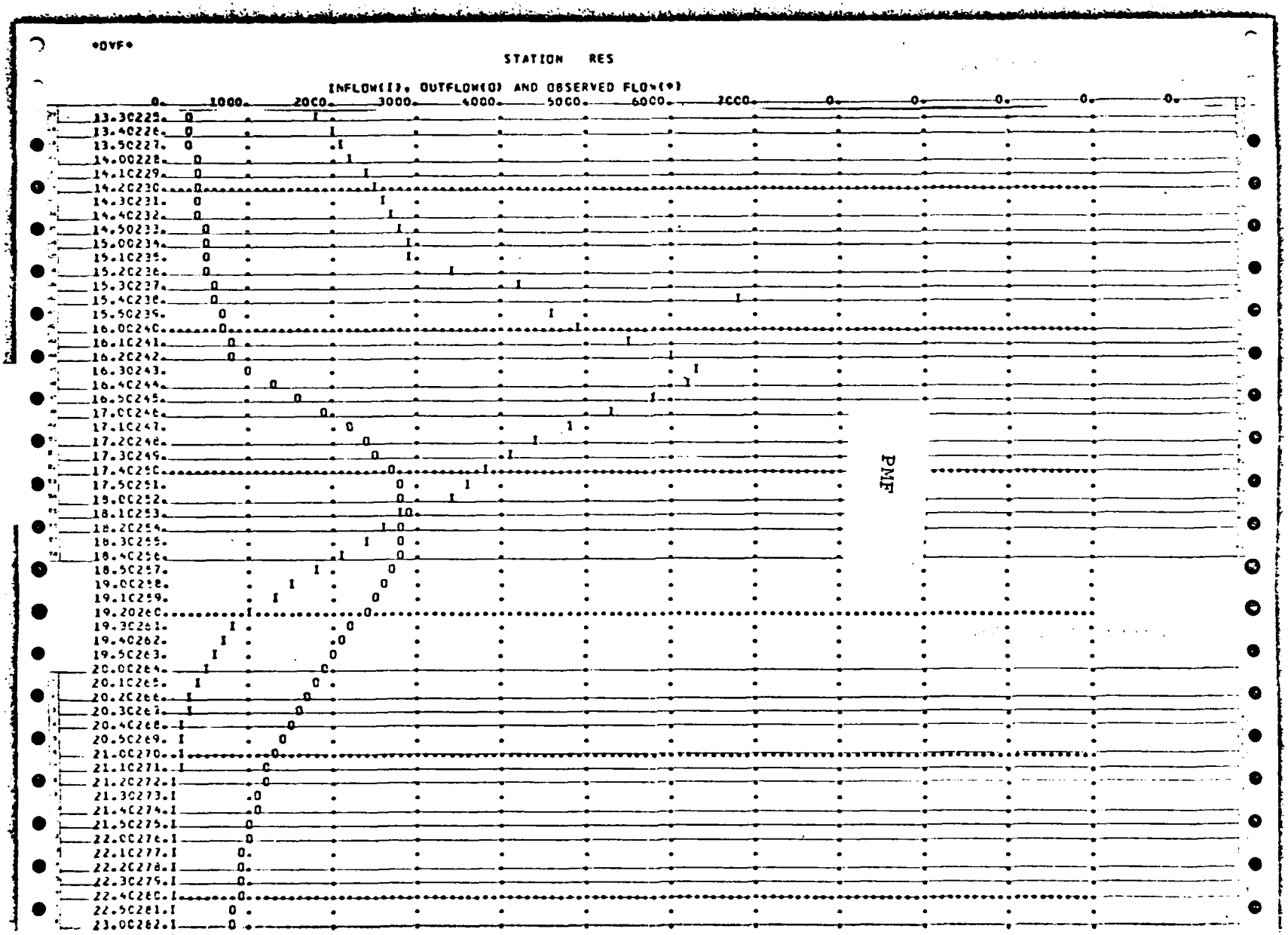
OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1	RATIO 2
				1.00	0.50
HYDROGRAPH AT	SA-1	1.58	1	5727.	2863.
		(4.08)		(162.17)(	81.08)(
HYDROGRAPH AT	SA-2	0.31	1	3915.	1958.
		(0.80)		(110.86)(	55.43)(
2 COMBINED	SA-2C	1.89	1	6849.	3425.
		(4.89)		(193.96)(	96.98)(
ROUTED TO	RES	1.89	1	2860.	692.
		(4.89)		(80.99)(	19.59)(

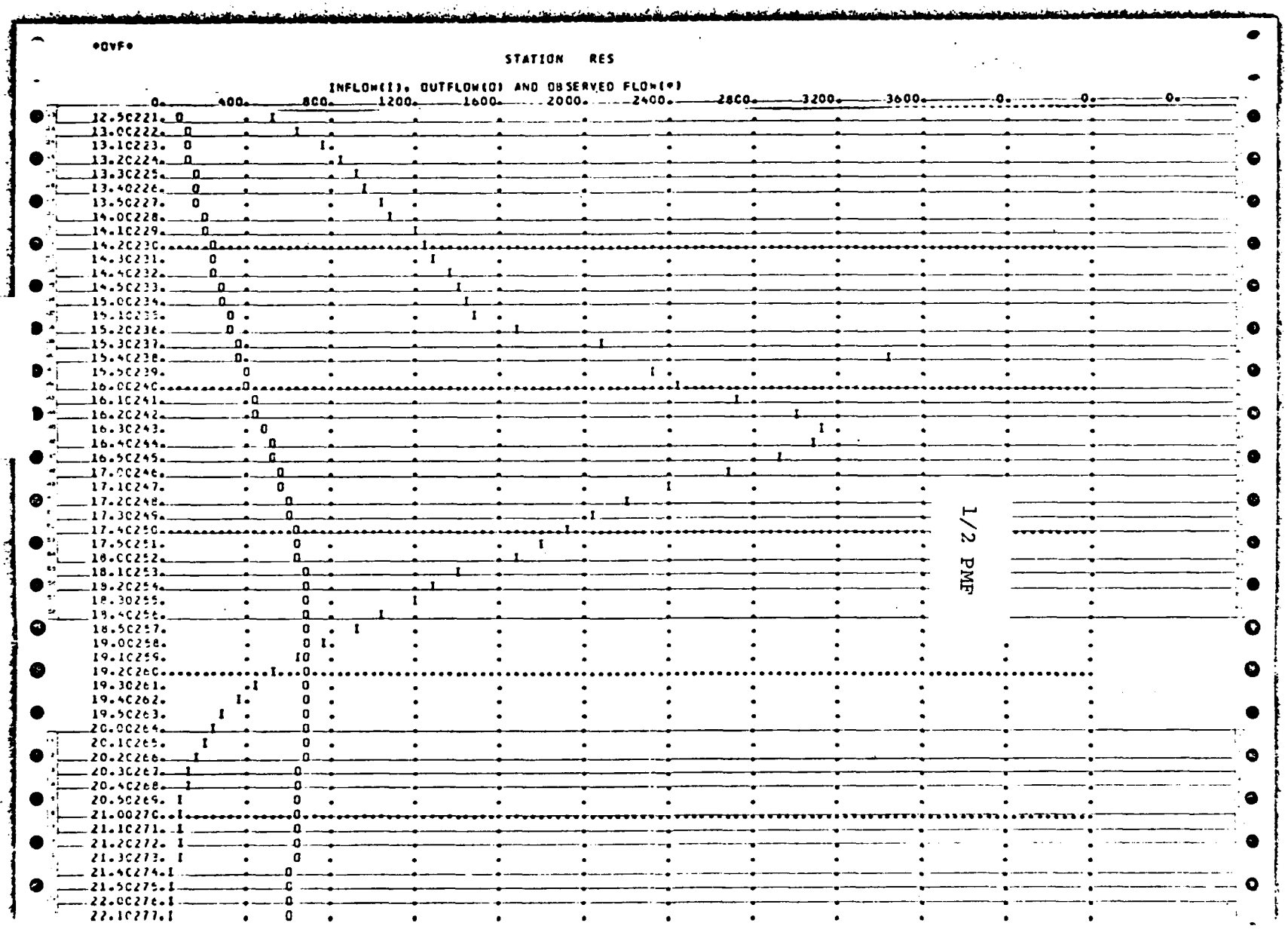
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	363.00	363.00	366.50
STORAGE	1538.	1538.	2464.
OUTFLOW	0.	0.	855.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	367.95	1.45	2847.	2860.	6.33	42.17	0.00
0.50	365.82	0.00	2284.	692.	0.00	43.17	0.00

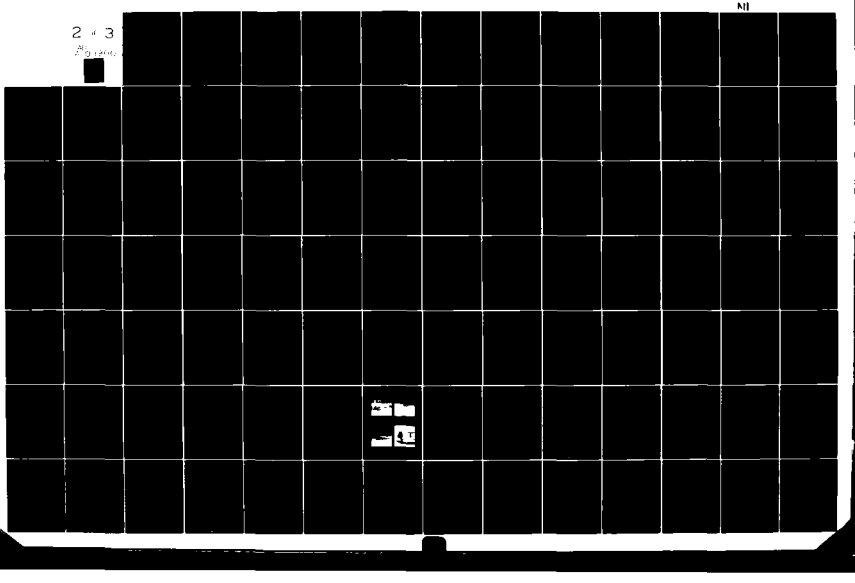

OVF
STATION RES
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0 1000 2000 3000 4000 5000 6000 7000 0 0 0 0 0
PMF

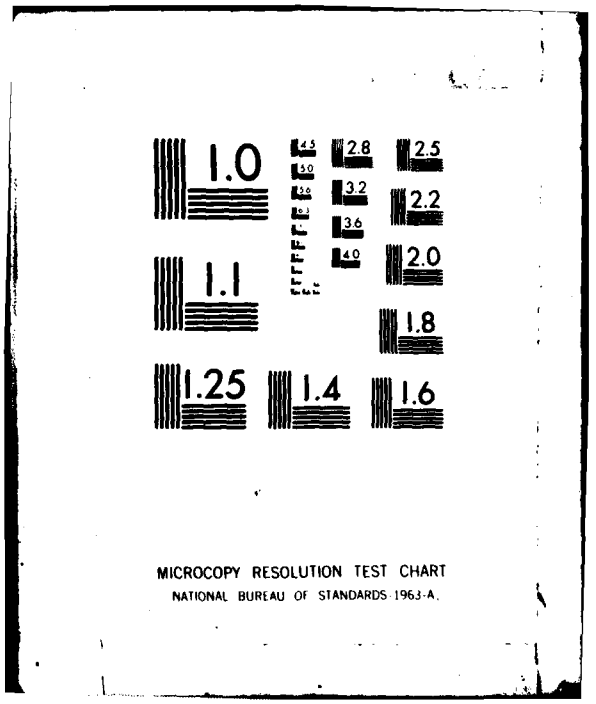

•OVF•
STATION RES
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 400. 800. 1200. 1600. 2000. 2400. 2800. 3200. 3600. 0. 0. 0.
1/2 PMF

APPENDIX

STABILITY ANALYSIS

AD-A109 900 MALE (C T) ASSOCIATES SCHENECTADY NY F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. SILVER STREAM RESERVOIR DAM (I--ETC(U)
JUL 81 K J MALE DACW51-81-C-0014
UNCLASSIFIED NL




1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A.

C. T. MALE ASSOCIATES, P. C.
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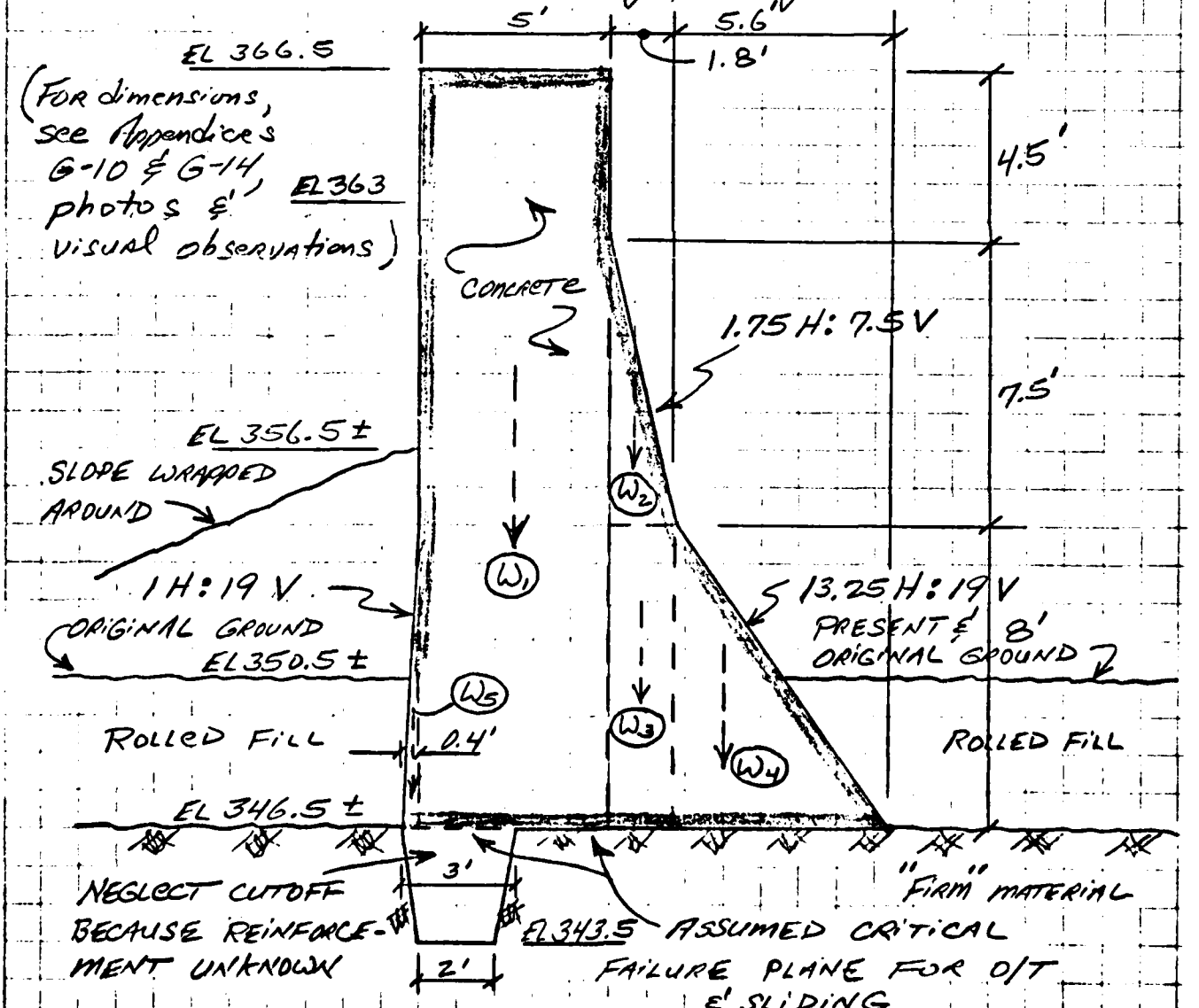
(518) 785-0976

JOB SILVER STREAM RES. DAM
SHEET NO. 1 OF 10
CALCULATED BY YAB DATE 8/14/81
CHECKED BY F. Cacciola DATE 8/18/81
SCALE 1/4" = 1'

STABILITY ANALYSIS OF CONCRETE DIKE

CROSS SECTION FOR ANALYSIS - Just toward center from bend points where height exposed is large compared to height below ground and there is earth pressure on upstream side due to embankment wrapped around, but no earth pressure on downstream side above original ground.



D-1

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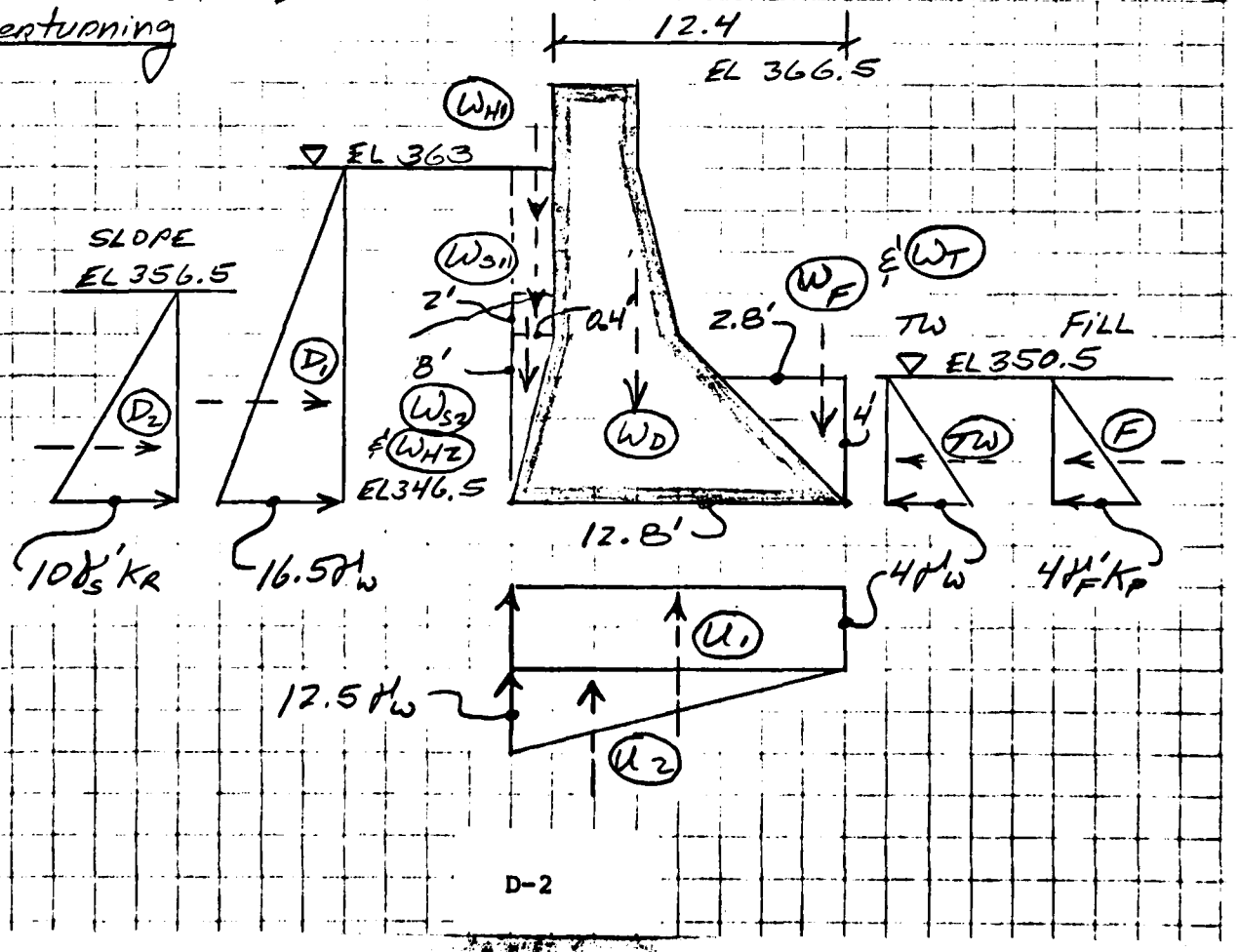
JOB SILVER STREAM RES. DAM
SHEET NO 2 OF 10
CALCULATED BY GMZ DATE 8/14/81
CHECKED BY F. Cervesa DATE 8/18/81
SCALE None

Dead Load	Volume	× Unit Wt.	=	W	× Arm about toe	=	Horiz. Moment M
W_1	5×20×1	× 0.150 kcf	=	15.00 k	× 5/2 + 1.8 + 5.6	=	148.50
W_2	½×1.8×7.5×1	× 0.150	=	1.01	× (1.8 × 2/3) + 5.6	=	6.89
W_3	1.8×8×1	× 0.150	=	2.16	× 1.8/2 + 5.6	=	14.04
W_4	½×5.6×8×1	× 0.150	=	3.36	× (5.6 × 2/3)	=	12.54
W_5	½×0.4×8×1	× 0.150	=	0.24	× (0.4/3) + 12.4	=	3.01
			W_D =	21.77 k		ΣM =	184.98 Ft-k

CASE 1 Normal pool at spillway crest, full HW & TW uplift, slope wrap around on U/S side about 10' below top by observation, TW at top of original ground by observation (due to ponded water)

Overturning



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JOB SILVER STREAM RES. DAM
SHEET NO. 3 OF 10
CALCULATED BY HPB DATE 8/14/81
CHECKED BY E.P. Corrivan DATE 8/18/81
SCALE None

CASE 1 - OVERTURNING (Cont'd)

Resisting Forces x Moment Arm about toe = M_R

W_D = dead load = (21.77) k per sheet 2 x (sheet 1) = 184.98 ✓

W_{S1} = Submerged wt. of slope where $\gamma_s' = 140\ \#/cf - 62.4$

$\gamma_s' = 77.6$, say $\gamma_s' \cong 78\ \#/cf = 0.078$ kcf

$= 0.4 \times 2 \times 0.078 =$ (0.06) k x $(0.4/2) + 12.4 =$ 0.79 ✓

$W_{S2} = 1/2 \times 0.4 \times 8 \times 0.078 =$ (0.12) x $(0.4 \times 2/3) + 12.4 =$ 1.58 ✓

W_{H1} = wt. of HW

$= 0.4 \times 8.5 \times 0.0624 =$ (0.21k) x $(0.4/2) + 12.4 =$ 2.67 ✓

W_{H2} = wt. of HW

$= 1/2 \times 0.4 \times 8 \times 0.0624 =$ (0.10) k x $(0.4 \times 2/3) + 12.4 =$ 1.26 ✓

W_T = wt. of normal TW

$= 1/2 \times 2.8 \times 4 \times 0.0624 =$ (0.35) k x $2.8/3 =$ 0.33 ✓

W_F = Submerged wt. of fill where $\gamma_F' = 140\ \#/cf - 62.4$

$\gamma_F' = 77.6$, say $\gamma_F' \cong 78\ \#/cf = 0.078$ kcf

$= 1/2 \times 2.8 \times 4 \times 0.078 =$ (0.44) x $2.8/3 =$ 0.41 ✓

F = Submerged fill pressure, where $\gamma_F' = 0.078$ kcf

& k_p = coeff. of horiz. passive earth pressure = 4.0

$= (1/2 \times 4 \times 0.078 \times 4)\ 4 = 2.50$ x $4/3 =$ 3.33 ✓

TW = normal TW pressure

$= (1/2 \times 4 \times 0.0624)\ 4 = 0.50$ x $4/3 =$ 0.67 ✓

$\Sigma M_R =$ 196.02 Ftk

Driving Forces M_D

D_1 = Normal HW pressure

$= (1/2 \times 16.5 \times 0.0624)\ 16.5 = 8.49$ x $16.5/3 = 46.72$

D_2 = Submerged slope pressure, where $\gamma_s' = 0.078$ kcf

& k_R = coeff. of horiz. earth pressure at rest = 0.5

$= (1/2 \times 10 \times 0.078 \times 0.5)\ 10 = 1.95$ x $10/3 = 6.50$

U_1 = normal TW uplift

$= 4 \times 0.0624 \times 12.8 =$ (3.19) x $12.8/2 = 20.45$

U_2 = normal HW uplift

$= (1/2 \times 12.5 \times 0.0624)\ 12.8 =$ (4.99) x $12.8 \times 2/3 =$ 42.60

$\Sigma M_D =$ 116.27 Ftk

Form CTM-405-A

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JOB SILVER STREAM RES. DAM
SHEET NO. 4 OF 10
CALCULATED BY WB DATE 8/14/81
CHECKED BY E Corliss DATE 8/18/81
SCALE None

CASE I - OVERTURNING (cont'd)

$FS = \Sigma M_R / \Sigma M_D = 196.02 / 116.27 = (1.69)$

Resultant from toe $= d = \Sigma M_T / \Sigma V = \dfrac{\Sigma M_R - \Sigma M_D}{W_D + \Sigma W_S + \Sigma W_H + W_T + W_F - U_1 - U_2}$

$d = \dfrac{79.75}{21.77 + 0.18 + 0.31 + 0.35 + 0.44 - 3.19 - 4.99} = \dfrac{79.75}{14.87} = 5.36$

$d = 5.36 \times b/12.8 = (0.42b)$

CASE I - SLIDING Assume horizontal failure plane along concrete/soil contact. Neglect cutoff because it is relatively narrow and reinforcement unknown. W/o reinforcement it could not function effectively as a shear key. (Same diagram as Case I o/t on sheet 2)

Resisting Forces

R_S = horiz. resisting force $= \Sigma V \tan\phi + c$ (Reference 1)

where c = cohesion along failure plane = 0

ϕ = Angle of sliding friction $\doteq 30°$ Assumed along Concrete/soil contact

ΣV = vertical effective force = 14.87 k per above

$R_S = 14.87 \tan 30° = 8.59$ k

Driving Forces

D_1 = normal HW pressure = (per sheet 3) = 8.49 k

D_2 = submerged slope pressure = " = 1.95

TW = normal TW pressure = " = ⊖ 0.50

F = submerged fill " = " = ⊖ 2.50

D_S = horiz. driving force = 7.44 k

$FS = R_S / D_S = 8.59 / 7.44 = (1.15)$

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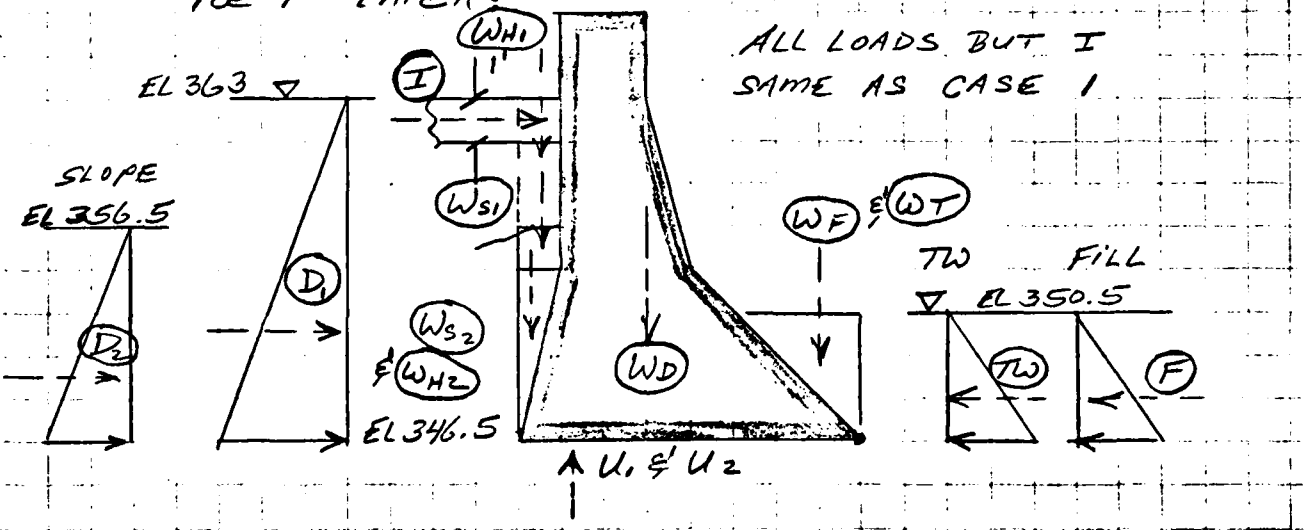
JOB SILVER STREAM RES. DAM
SHEET NO. 5 OF 10
CALCULATED BY JMB DATE 8/14/81
CHECKED BY F Curran DATE 8/18/81
SCALE None

Form CTM-405A

CASE 2 - Normal pool plus ice load of 5k/LF for ice 1' thick.



ALL LOADS BUT I SAME AS CASE 1

Resisting Forces × Moment arm about toe = M_R

All same as Case 1, sheet 3 → ΣM_R = 196.02 Ftk

Driving Forces M_D

D_1, D_2, U_1, U_2 same as Case 1, sheet 3 = 116.27

I = ice load = 5k × (16.5 - 0.5) = 80.00

ΣM_D = 196.27

$FS = \Sigma M_R / \Sigma M_D = \frac{196.02}{196.27} =$ **1.00**

Resultant from toe = $d = \Sigma M_T / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{\Sigma V \text{ same as Case 1}}$

$d = \frac{-0.25}{14.87} = -0.02 \times \frac{b}{12.8} =$ **$\pm 0.00b$**

CASE 2 - SLIDING same failure plane & theory as Case 1, sheet 4

Resisting Forces

Since ΣV same as Case 1, R_S = 8.59k same as Case 1.

Driving Forces

D_1, D_2, TW & F same as Case 1, sheet 4 = 7.44k

I = ice load = → 5.00k

$FS = R_S / D_S = 8.59 / 12.44 =$ **0.69** < 1.0 D_S = 12.44k

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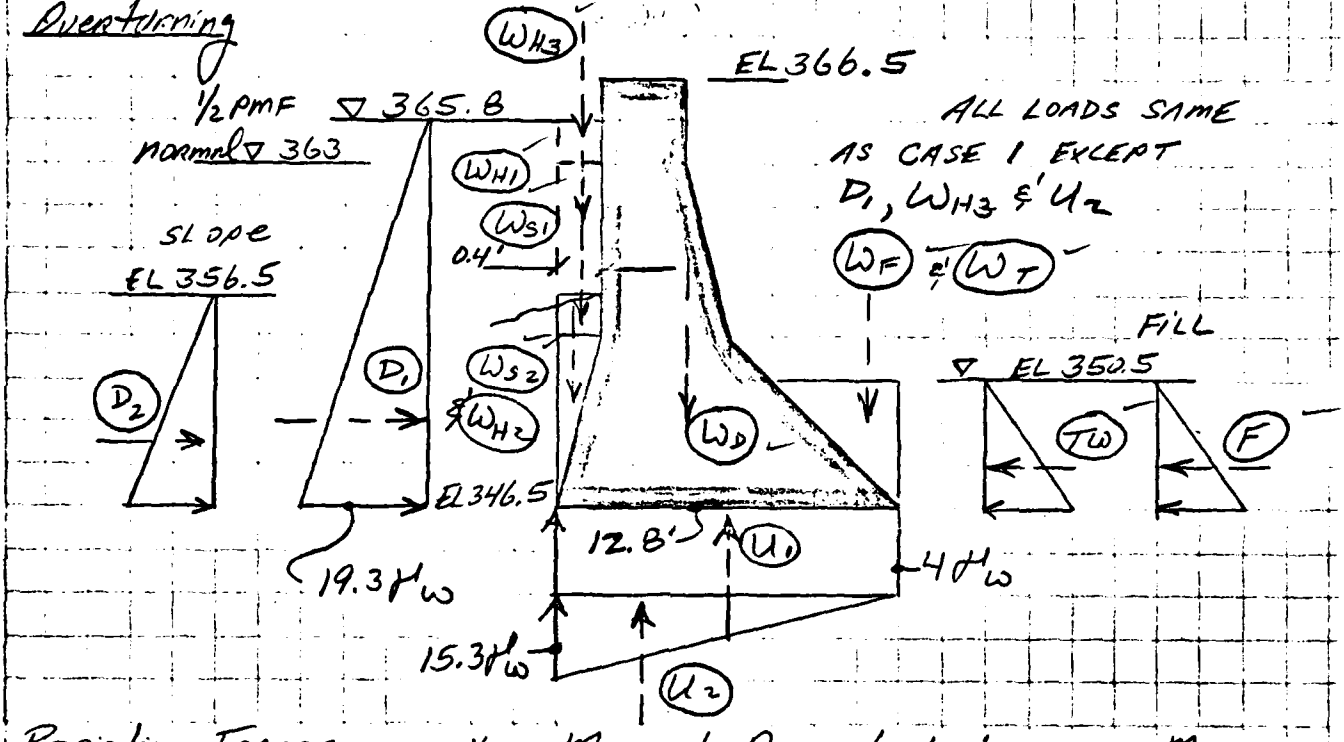
JOB SILVER STREAM RES. DAM
SHEET NO. 6 OF 10
CALCULATED BY JPB DATE 8/15/81
CHECKED BY F Cacivio DATE 8/18/81
SCALE None

CASE 3 - 1/2 PMF pool full HW & TW uplift, remainder same as Case 1

Overturning



Resisting Forces	×	Moment Arm about toe	=	M_R
All except W_{H3} same as total for Case 1, sheet 3			=	196.02
W_{H3} = wt. of flood HW = $0.4 \times 2.8 \times 0.0624 = 0.07\,k$	×	$(0.4/2) + 12.4$	=	0.88
			ΣM_R =	196.90

Driving Forces				M_D
D_2 = submerged slope press. same as Case 1, sheet 3			=	6.50
U_1 = normal TW uplift			=	20.45
U_2 = flood HW uplift = $(1/2 \times 15.3 \times 0.0624) 12.8 = 6.11$	×	$12.8 \times 2/3$	=	52.14
D_1 = flood HW pressure = $(1/2 \times 19.3 \times 0.0624) 19.3 = 11.62$	×	$19.3/3$	=	74.77
			ΣM_D =	153.85

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JOB SILVER STREAM RES. DAM
SHEET NO. 7 OF 10
CALCULATED BY JMR DATE 8/15/81
CHECKED BY F. Caruso DATE 8/18/81
SCALE None

CASE 3 - OVERTURNING (cont'd)

$FS = \Sigma M_R / \Sigma M_O = 196.90 / 153.85 =$ (1.28)

Resultant from toe $= d = \Sigma M_T / \Sigma V = \dfrac{\Sigma M_R - \Sigma M_O}{W_D + \Sigma W_S + \Sigma W_H + W_T + W_F - U_1 - U_2}$

$d = \dfrac{43.05}{21.77 + 0.18 + 0.38 + 0.35 + 0.44 - 3.19 - 6.11} = \dfrac{43.05}{13.82} = 3.12$

$d = 3.12 \times 6/12.8 =$ (0.246)

CASE 3 - SLIDING same failure plane & theory as Case 1, sheet 4 & same diagram as Case 3 o/t, sheet 6.

Resisting Forces

ΣV - 13.82 as above

$R_S = \Sigma V \tan 30° = 7.98^k$

Driving Forces

D_1 = V flood HW pressure = (per sheet 6) = 11.62
D_2 = submerged slope press. = (per sheet 3) = 1.95
TW = normal TW press. = " " " = ⊖ 0.50
F = submerged fill press. = " " " = ⊖ 2.50
D_S = 10.57

$FS = R_S / D_S = 7.98 / 10.57 =$ (0.75) < 1.0

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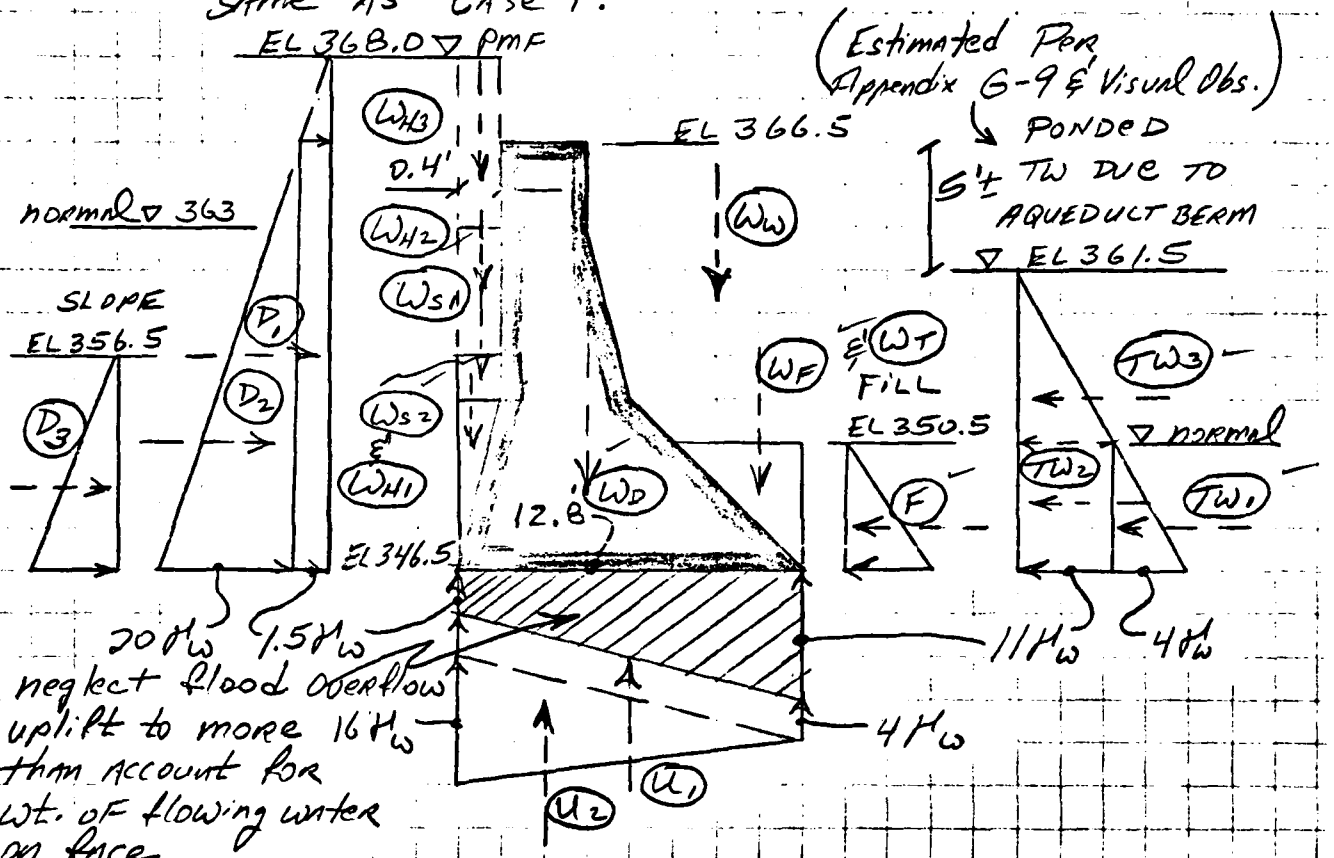
JOB SILVER STREAM RES DAM
SHEET NO. 8 OF 10
CALCULATED BY JMA DATE 8/15/81
CHECKED BY F Carlucci DATE 8/18/81
SCALE None

CASE 4 - PMF pool, full HW & TW uplift, remainder same as Case 1.



Resisting Forces	× Moment arm about toe =	M_R
W_D = dead load = same as Case 1, sheet 3	=	184.98
W_{S1} = submerged wt. of slope = same as Case 1, sheet 3	=	0.79
W_{S2} = " " " " " = " " " "	=	1.58
W_{H1} = wt. of normal HW = " " " "	=	2.67
W_{H2} = " " " " = " " " "	=	1.26
W_{H3} = " " flood HW		
= 0.4 × 5 × 0.0624 = 0.12k × (0.4/2) + 10.4	=	1.57
W_T = wt. of normal TW = same as Case 1, sheet 3	=	0.33
W_F = submerged wt. of fill = " " " "	=	0.41
F = " fill pressure = " " " "	=	3.33

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(518) 785-0976

JOB SILVER STREAM RES. DAM
SHEET NO. 9 OF 10
CALCULATED BY DMB DATE 8/15/81
CHECKED BY F.A. Corrigan DATE 8/18/81
SCALE None

CASE 4 - PMF OVERTURNING (cont'd)

TW_1 = normal TW pressure = same as Case 1, sheet 3 = 0.67

TW_2 = flood TW pressure = $(11 \times 0.0624 \times 4) = 2.75^k$ x 4/2 = 5.49

TW_3 = " " " = $(1/2 \times 11 \times 0.0624)11 = 3.78^k$ x $(11/3 + 4)$ = 28.94

W_w = wt. of flowing water more than counterbalanced by flood overflow uplift = —0—

ΣM_R = 232.02

Driving Forces

D_1 = Flood overflow HW pressure
= $1.5 \times 0.0624 \times 20$ = 1.87 x 20/2 = 18.72

D_2 = Flood HW pressure
= $(1/2 \times 20 \times 0.0624)20 = 12.48$ x 20/3 = 83.20

D_3 = Submerged slope press. = same as D_2 from Case 1, sheet 3 = 6.50

U_1 = normal TW uplift = same as Case 1, sheet 3 = 20.45

U_2 = non-overflow HW uplift
= $(1/2 \times 16 \times 0.0624)10.8 = 6.39$ x $10.8 \times 2/3$ = 54.53

ΣM_D = 183.40

$FS = \Sigma M_R / \Sigma M_D = 232.02 / 183.40 =$ **1.27**

Resultant from toe = $d = \Sigma M_T / \Sigma V = \dfrac{\Sigma M_R - \Sigma M_D}{W_D + \Sigma W_S + \Sigma W_H + W_T + W_F - U_1 - U_2}$

$d = \dfrac{48.62}{21.77 + 0.18 + 0.43 + 0.35 + 0.44 - 3.19 - 6.39} = \dfrac{48.62}{13.59}$

$d = 3.58 \times \dfrac{6}{12.8} =$ **0.28 b**

Form M-11A

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB SILVER STREAM RES. DAM
SHEET NO. 10 OF 10
CALCULATED BY YAB DATE 8/15/81
CHECKED BY F Corrigan DATE 8/18/81
SCALE None

CASE 4 - PMF SLIDING same failure plane & theory as Case 1, sheet 4 & same diagram as Case 4 o/t, sheet 8

Resisting Forces

ΣV = 13.59 as above

$R_s = \Sigma V \tan 30° = 7.85k$

Driving Forces

D_1 = flood overflow HW pressure = (per sheet 9) = 1.87

D_2 = flood HW pressure = " " " = 12.48

D_3 = submerged slope press. = (D_2 per sheet 3) = 1.95

F = submerged fill press. = (per sheet 3) = ⊖ 2.50

TW_1 = normal TW press. = " " " = ⊖ 0.56

TW_2 = flood TW press. = (per sheet 9) = ⊖ 2.75

TW_3 = " " " = " " " = ⊖ 3.78

D_s = 6.77

$FS = R_s/D_s = 7.85/6.77 = \boxed{1.16}$

APPENDIX E

REFERENCES

SILVER STREAM RESEVOIR DAM, NY 00511

PHASE I INSPECTION REPORT

REFERENCES

This is a general list of references pertinent to dam safety investigations. Not all references listed have necessarily been used in this specific report.

1. "Engineering and Design, National Program For Inspection of Non-Federal Dams", ER 1110-2-106, Dept. of the Army, Office of the Chief of Engineers, 26 September 1979, with Change 1 of 24 March 1980. Included as Appendix D of the ER is "Recommended Guidelines For Safety Inspection of Dams".

2. "HEC-1 Flood Hydrograph Package, Users Manual", The Hydrologic Engineering Center, U.S. Army Corps of Engineers, January 1973.

3. "Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations", The Hydrologic Engineering Center, U.S. Army Corps of Engineers, September 1978.

4. HMR 33, "Seasonal Variations of Probable Maximum Precipitation, East of the 105th Meridian for Areas 10 to 1000 Square Miles and Durations from 6 to 48 Hours," U.S. Dept. of Commerce, NOAA, National Weather Service, 1956.

5. HMR 51, "All-Season Probable Maximum Precipitation, U.S. East of 105th Meridian for Areas from 1000 to 20,000 Square Miles and Durations from 6 to 72 Hours", U.S. Dept. of Commerce, NOAA, National Weather Service, 1974.

6. HYDRO-35, "Five-to-60 Minute Precipitation Frequency for the Eastern and Central United States", U.S. Dept. of Commerce, NOAA, National Weather Service, June 1977.

7. "Technical Paper No. 40, Rainfall Frequency Atlas of the United States", U.S. Dept. of Commerce, Weather Bureau, 1961.

8. Design of Small Dams, United States Dept. of the Interior, Bureau of Reclamation, Second Edition, 1973, Revised Reprint, 1977.

9. King, Horace W. and Brater, Ernest F., Handbook of Hydraulics, fifth edition, McGraw-Hill Book Co., Inc., New York, N. Y., 1963.

10. "Flood Hydrograph Analyses and Computations", EM 1110-2-1405, U.S. Army Corps of Engineers, 31 August 1959.

11. "Technical Release No. 55, Urban Hydrology for Small Watersheds", U.S. Dept. of Agriculture, Soil Conservation Service (Engineering Division), January 1975.

12. National Engineering Handbook, Section 4, Hydrology, U. S. Dept. of Agriculture, Soil Conservation Service, August 1972.

13. "Hydraulic Design of Spillways", EM 1110-2-1603, U.S. Army Corps of Engineers, 31 March 1965, with Change 1 included.

14. "Standard Project Flood Determinations", EM 1110-2-1411, U.S. Army Corps of Engineers, 26 March 1952.

15. "Hydrologic and Hydraulic Assessment", Appendix D of EC 1110-2-188, U.S. Army Corps of Engineers, 30 December 1977.

16. "Reviews of Spillway Adequacy, National Program of Inspection of Non-Federal Dams", ETL 1110-2-234, U.S. Army Corps of Engineers, 10 May 1978.

17. Hammer, Mark J., Water and Waste-Water Technology, John Wiley & Sons, Inc., New York, 1975.

18. "Hydraulic Charts For the Selection of Highway Culverts", Hydraulic Engineering Circular No. 5, U.S. Department of Commerce, Bureau of Public Roads, December 1965.

19. "Guide for Making a Condition Survey of Concrete in Service", American Concrete Institute (ACI) Journal, Proceedings Vol. 65, No. 11, November 1968, pages 905-918.

20. "Lower Hudson River Basin, Hydrologic Flood Routing Model", New York District, Corps of Engineers, January 1977.

21. "Climatological Data, Annual Summary, New York, 1979", Volume 91, No. 13, National Oceanic and Atmospheric Administration, Asheville, North Carolina.

22. "Climatological Data, New York, September 1980", Volume 92, No. 9, National Oceanic and Atmospheric Administration, Asheville, North Carolina.

23. "Water Resources Data For New York, Water Year 1979", Volume 1, USGS Water-Data Report NY-79-1, U.S. Geological Survey, Albany, New York, 1980.

24. "Maximum Known Stages and Discharges of New York Streams Through 1973", Bulletin 72, U.S. Geological Survey, 1976.

25. "Characteristics of New York Lakes (Gazetteer)", Bulletin 68, U.S. Geological Survey and NYS Department of Environmental Conservation, 1970.

26. "Gravity Dam Design", EM 1110-2-2200, U.S. Army Corps of Engineers, 25 September 1958, with Changes 1 & 2 included.

27. "Gravity Dam Design - Stability", ETL 1110-2-184, U.S. Army Corps of Engineers, 25 February 1974.

28. Geologic Map of New York, Lower Hudson Sheet, New York State Museum and Science Service, University of the State of N.Y., State Education Dept., Albany, N.Y., reprinted 1973.

29. "Landforms and Bedrock Geology of New York State", New York State Museum and Science Service, University of the State of N.Y., State Education Dept., Albany, N.Y., reprinted 1973.

30. Terzaghi, Karl and Peck, Ralph B., Soil Mechanics in Engineering Practice, second edition, John Wiley & Sons, Inc., New York, N.Y., 1967.

31. "Washington Lake Dam NY 603, Phase I Inspection Report", U.S. Army Corps of Engineers, by L. Robert Kimball and Associates, 1978.

APPENDIX F

AVAILABLE ENGINEERING DATA AND RECORDS

TABLE OF CONTENTS

APPENDIX F

SECTION F1

LOCATION OF AVAILABLE ENGINEERING DATA AND RECORDS

1. Owner: City of Newburgh
City Hall
83 Broadway
Newburgh, NY 12550
Attn: Gary J. Bloomquist, City Manager
914-565-3333

James W. Brown, Water Superintendent
Newburgh Water Department
79 Dubois Street
Newburgh, NY 12550
914-565-3356

Available: Design/construction drawings & specifications, as-built drawings, photos of 1978 repairs.

2. Designer: Fuller & Harding, Consulting Engineers
170 Broadway
New York, NY (James C. Harding)
(No longer in business.)

3. Construction Contractor: Unknown.

4. Agency: NYS Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233
Attn: George Koch, P.E., Chief, Dam Safety Section
518-457-5557

Available: Drawings, specifications, letters, application for construction, inspection report.

NYS Department of Environmental Conservation
Division of Fish & Wildlife
50 Wolf Road
Albany, NY 12233
Attn: Patrick Festa, Supervising Aquatic Biologist
518-457-6937

Available: Data on the reservoir.

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PHASE I INSPECTION

CHECKLIST FOR GENERAL ENGINEERING DATA
& INTERVIEW WITH DAM OWNER

Name of Dam Silver Stream Res. Dam Fed. Id.# NY 00511

Date April 9, 1981 Interviewer(s) Thomas P. Bennedum

Dam Owner/Representative(s) Interviewed, Title & Phone# James W. Brown, Water Supt., 914-565-3356, George Ranson & Jim Cannelli, Water Dist. Employees (same tel. as Brown), Dominick Palermo, Ass't. Civil Eng'r., & Bea Cornell, Secretary), 914-565-5223

1. OWNERSHIP (name, title, address & phone #) City of Newburgh, City Hall, 83 Broadway, Newburgh, NY 12550, Attn: Gary J. Bloomquist, City Manager 914-565-3338

2. OPERATOR (name, title, address & phone # of person responsible for day-to-day operation) James W. Brown, Water Superintendent, Newburgh Water Dept., 79 Dubois St., Newburgh, NY 12550, 914-565-3356

   a. Operator Full/Part time Part Time Operator, F/T Supt. since 1974.

3. PURPOSE OF DAM

   a. Past Water Supply. A regulating reservoir feeding Lake Washington d/s via Silver Stream Diversion Dam.

   b. Present Water Supply. City owns 20-30' around reservoir & dam & some of watershed.

4. DESIGN DATA

   a. Designed When 1922

   b. By (name, address, phone #, business status) Fuller & Harding, Consulting Engineers (James C. Harding) 170 Broadway, New York, NY (no longer in business)

   c. Geology Reports None known

   d. Subsurface Investigations None known, except references to conditions in letter, App. F3-40, & on drawings, App. G.

   e. Design Reports/Computations (H&H, stability, seepage) No reservoir x-sects. or capacity calculations done. None known. Capacity est. 400-600 mg. c spillway.

f. Design Drawings (plans, sections, details) Yes, see Appendix G.

g. Design Specifications Yes, see Appendix F3-1.

h. Other All dwgs. & data are in City Eng'r Dept. & are not well cataloged or organized. Suspect more data could be found by an exhaustive search.

5. CONSTRUCTION HISTORY

a. Initial Construction

1) Completed When 1923

2) By (name, address, phone #, business status) Unknown

3) Borrow Sources/Material Tests For tests of concrete sand, see Appendix F3-4B.

4) Construction Reports/Photos Appear to be old field books of construction surveys in City Eng'r Dept.

5) Diversion Scheme/Construction Sequence Sequence of concrete placement in core wall shown on as-built dwgs., see Appendix G-12.

6) Construction Problems None Known

7) As-Built Drawings (plans, sections, details) Yes. Complete elevations & sections on two large rolls in City Engr. Dept. Copies of selected portions included starting on Appendix G-12.

8) Data on Electrical & Mechanical Equipment Affecting Safe Operation of Dam No electrical equipment or lights at dam. Outlet gate shown on des/const. dwgs., Appendix G-5

9) Other n/a

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b. Modifications (review design data & initial construction items as applicable & describe)

• 1940 ± drainage system installed for wet area d/s of West Dam (dike). No records of this work. Reportedly is drainage pipe that empties into stream d/s of NYC Siphon x-ing.

• 1964-65 temporary tap made in NYC Siphon d/s of dam to dump supplementary water directly into stream.

c. Repairs & Maintenance (review design data & initial construction items as applicable & describe)

• Date Unknown, steel braces bolted on left training wall of outlet structure to prevent further movement of cracked d/s end. No records.

• 1967-68 got cost estimate by gunite contractor to repair conc. dam, but work not done due to cost.

• See 4 - OTHER

6. OPERATION RECORD

a. Past Inspections (dates, by, authority, results) Only record - Sept. 18, 1974 by NYS-DEC, see Appendix E3-51. Indicates satisfactory condition.

b. Performance Observations (seepage, erosion, settlement, post-construction surveys, instrumentation & monitoring records) None known. No instrumentation.

c. Post-Construction Engineering Studies/Reports None known, except 1936 data on reservoir taken by NYS. Bureau of Fish & Wildlife, see Appendix F3-50.

d. Routine Rainfall, Reservoir Levels & Discharges • City has a rain gage at filter plant, records 1950 - present. Gage being replaced now & will resume operation soon.

• Daily water level readings from top of dike available on daily filter plant reports about 1960 - present. Reports go to State Health Dept. monthly. Readings started 1929 ±.

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e. Past Floods That Threatened Safety (when, cause, discharge, max. pool elevation, any damage)

None known

f. Previous Failures (when, cause, describe)

None known

g. Earthquake History (seismic activity in vicinity of dam)

None known

7. VALIDITY OF DESIGN, CONSTRUCTION & OPERATION RECORDS (note any apparent inconsistencies)

• Alternate D, concrete gravity sect., actually built for West Dam (dike), see letter App. F3-39 & dwg. App. G-10. Specs available (Appendix F3-1) do not include Alternate D.

• See 9- OTHER

8. OPERATION & MAINTENANCE PROCEDURES

a. Operation Procedures in writing? No Obtain copy or describe. (reservoir regulation plan, normal pool elevation and status of operating facilities, who operates & means of communication to controller, mode of operating facilities, i.e., manual, automatic, remote)

• Normal pool @ spillway crest. No flashboards or provisions for them.

• All inflow only from drainage area runoff. No connection from NYC Aqueducts

• See page F2-6

b. Maintenance Procedures in writing? No Obtain copy or describe.

• No routine maintenance except mowing grass.

• Try to do other work when needed, but limited by funds to priority items.

• Dam visited daily. No records except water level readings (see 8a-Operation).

c. Emergency Action Plan & Warning System in Writing? No
Obtain copy or describe. (actions to be taken to minimize the D/S effects of an emergency)

- No real thought given to this. Never had to evacuate.
- Probably contact Fire Dept. of Town of New Windsor.

9. OTHER

5c) Repairs • 1978 visible holes & cracks in concrete dike cleaned & repaired by a mason (CETA Employee, name unknown). Only record are photos taken by Operator, samples included on Appendix F3-52.

7) Validity

- Elevations on dwgs. about 1.5' lower than NGVD.
- Invert of outlet pipe by field measurement about 0.6' lower than dwgs. show after adjustment.

C. T. MALE ASSOCIATES, P. C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB Silver Stream Res. Dam
SHEET NO. 1 OF 1
CALCULATED BY GPB DATE 4/9/81
CHECKED BY n/a DATE n/a
SCALE n/a

8a) Operation

- Level maintained by manually operating 48" gate. Normal position can be anywhere from full open to full closed depending on water needs.
- Gate operated by water dept. employees, usually George Ranson & Jim Cannelli. Requires 2 men to operate due to weight of gate.
- Daily water level readings taken from top of dike & recorded in daily filter plant report.

APPENDIX F

SECTION F3

COPIES OF ENGINEERING DATA AND RECORDS

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CITY OF NEWBURGH, N. Y.

NOTICE TO BIDDERS

PROPOSAL

CONTRACT

SPECIFICATIONS

for

SILVER STREAM DAM

APRIL, 1923

W. JOHNSTON McKAY
CITY MANAGER

DEC

CITY OF NEWBURGH, N. Y.

DAM CONSTRUCTION

NOTICE TO CONTRACTORS.

Sealed proposals for the construction of dams will be received by the City Manager, Newburgh, N. Y., at his office in the City Hall until 12 o'clock, noon, on Tuesday, the 3rd day of April, 1923, and at that time will be publicly opened and read.

The work comprises the construction of two dams, an easterly earth dam with a concrete core wall and spillway, and alternate bids are asked for the construction of the second dam adjacent to the easterly dam, two alternates providing for an earth dam with concrete core wall and the other for a reinforced concrete facing wall with earth backing. The work lies about two miles southerly of Newburgh at the point where the southerly branch of Silver Stream crosses under the New York City Aqueduct at what is generally spoken of as the Washington siphon. While the bids are divided as between the east and west dam, the work will be let to a single contractor, the character of construction for the west dam being decided by economical construction as represented by the bids.

Plans and Specifications.

Copies of the plans and specifications may be seen at the office of the City Engineer of Newburgh, N. Y., and copies of the plans, specifications, contract, and form of proposal may

DEC

be obtained at that office or at the office of the Engineers, 170 Broadway, New York City, upon the deposit of $15, of which $10 will be refunded if the said plans and specifications are returned in good condition within thirty (30) days after bids have been received and acted upon by the City of Newburgh.

Proposal.

The typewritten form of proposal contained herein shall be used in making out the bid. The prices must be written in the proposal in words and also stated in figures, and any proposal not in accordance with these instructions or not on the blanks furnished, or containing bids not asked for, may be rejected. No proposal will be considered from any bidder unless he is known to be skilled in work of a similar nature to that covered by this contract. While separate prices are required for various items under this contract, it is to be understood that the contract will be awarded as a whole.

Name of Bidder.

Each bidder must state in his proposal his full name and business address, and the full name of every person, firm or corporation interested in the same, and the address of every person or firm, or president and secretary of every corporation interested with him.

Certified Check.

Each bid must be accompanied by a certified check upon an acceptable National Bank or Trust Company, amde payable to the order of the City of Newburgh, or by cash to the amount of Five Thousand Dollars ($5000.).

DEC

Signing of Contract.

The bidder to whom the contract may be awarded shall, within ten (10) days (Sundays excepted) after date of notification of the acceptance of his proposal, sign the contract for the work and furnish approved secureity for its performance. In case of failure or neglect so to do, the bidder will be considered as having abandoned the same, and the certified check accompanying his proposal shall be forfeited to and retained by the City of Newburgh as liquidated damages for such failure or neglect.

Return of Checks.

The checks of all unsuccessful bidders will be returned upon demand after the execution of the contract, and also the check of the successful bidder after the execution of the contract and furnishing of the required security.

Security.

A bond in the sum of Forty-five Thousand Dollars ($45,000) with a satisfactory surety company will be required, conditioned upon the faithful performance of the work, said bond to remain in force for one year after the final completion and acceptance of the work.

Verbal Answers.

The City will not be responsible in any manner for verbal answers to any inquiries regarding the meaning of the drawings or specifications given prior to the awarding of the contracts.

DEC

Responsibility of Contractor.

Attention is here particularly directed to the provisions of the contract whereby the Contractor shall be responsible for any loss or damage that may happen to the work or any part thereof during its progress; and also whereby the Contractor shall make good any defects or faults that may occur during the progress of the work or within 12 months after its completion and acceptance.

Engineer's Estimate.

All bids must be compared on the basis of the Engineer's estimate of the work to be done, as follows:

EAST DAM.

1.	Earth excavation including stripping except for core walls and cut-off walls,	3,000	cu.yds.
2.	Earth excavation for core walls and cut off wals,	570	"
3.	Rock excavation,	10	"
4.	Plain concrete,	1,350	"
5.	Refinforced concrete,	90	"
6.	Reinforcing steel,	8,000	lbs.
7.	Earth embankment,	12,000	cu.yds.
8.	Paving,	2,300	sq.yds.
9.	Broken stone or gravel,	50	cu.yds.
10.	Blow-off piping, valve, gate house, superstructure, foot bridge and appurtenances,	complete	

DEC

WEST DAM (ALTERNATE A)

1.	Earth excavation including stripping except for core walls and cut-off walls, ...	12,000	cu.yds.
2.	Earth excavation for core walls and cut off walls, .	670	"
3.	Rock excavation, , ...	10	"
4.	Plain concrete, ...	1,210	"
5.	Reinforced concrete, ...	5	"
6.	Reinforcing steel, ...	100	lbs.
7.	Emabnkment, earth	26,000	cu.yds.
8.	Paving, ...	2,200	sq.yds.
9.	Broken stone or gravel, ...	50	cu.yds.

WEST DAM (ALTERNATE B)

1.	Earth excavation including stripping except for core walls and cut-off walls, ...	7,000	cu.yds.
2.	Earth excavation for core walls and cut off walls, .	2,000	"
3.	Rock excavation, ...	10	"
4.	Plain concrete, ...	430	"
5.	Reinforced concrete, ...	1,700	"
6.	Reinforcing steel, ...	150,000	lbs.
7.	Earth emabnkment, ...	13,000	cu.yds.
8.	Paving, ...	1,500	sq.yds.
9.	Broken stone or gravel, ...	50	cu.yds.

DEC

WEST DAM (ALTERNATE C)

1.	Earth excavation including stripping except for core walls and cut-off wals, ...	8,700 cu.yds
2.	Earth excavation for core walls and cut off walls, .	500 "
3.	Rock excavation, ...	10 "
4.	Plain concrete, ...	900 "
5.	Reinforced concrete, ...	5 "
6.	Reinforcing steel, ...	100 lbs.
7.	Earth embankment, ...	19,000 cu.yds
8.	Paving, ...	1,800 sq.yds
9.	Broken stone or gravel, ...	50 cu.yds

These quantities are approximate, being given only as a unifrom basis for the comparison of bids, and the City reserves the right to increase or decrease the amount of any class or portion of the work during the progress of construction, as provided in the contract and specifications.

No Withdrawal of Bids.

No bid will be allowed to be withdrawn, for any reason whatever, after it has been depesited with the City Manager; and all bidders expressly waive the right to withdraw bids after deposit for any reason whatever.

Acceptance and Rejection.

The City further reserves the right to reject any or all bids, to waive any informaility in the bids received, and to accept any bid, which, in its judgment, may be most favorable in the interests of the City.

W. JOHNSTON McKAY

DEC

F3-7 City Manager.

CITY OF NEWBURGH, N. Y.

DAM CONSTRUCTION

PROPOSAL

To the City of Newburgh, N.Y.:

The undersigned, as bidder, declares that the only person, persons, company or parties interested in this proposal are named herein; that the proposal is made without any connection with any person making any other proposal for the same work; that it is in all respects fair and without fraud or collusion, and that no member of the City Council of Newburgh, and no person appointed to any office or employed by virtue of any ordinance of the City of Newburgh relative to the Public Works of said City is directly or indirectly interested in this proposal, or in the contract proposed to be taken or in the supplies or in any portion of the profits thereof.

The undersigned declares that he has personally examined the site of the work and made such investigations as are necessary to determine the general conditions and the character of material likely to be encountered; that he has carefully examined each and every item of the annexed form of contract and the plans and specifications therein referred to, and that he fully understands the same; and that he will make no claim other than as stated in the contract and specifications on account of any variation between the quantities of the approximate estimate and the quantities of work actually done, nor on account of any misunderstanding or misconception of the nature, character or amount of the work to be done. Information given on the plans or specifications or verbally as regards the character of excavation and foundations to be

DEC

encountered are considered by the undersigned as approximate only and given for the purpose of assisting the bidder, and that such information may or may not be correct and represent only information obtained by the City for their own purpose, the undersigned having made therefore such investigations as he thought necessary to determine the accuracy of such information for himself.

The undersigned hereby offers and agrees to provide all necessary machinery, tools, apparatus, and other means for the construction, and do all the work and supply all the materials and labor called for by said contract, plans and specifications, or necessary to compl te the work, in the manner and within the time therein prescribed, and according to the requirements of the City as therein provided, for the following sums, to wit:

FORM OF PROPOSAL.

EAST DAM.

Item 1. - For earth excavation including stripping, except for core walls and cut off walls, the sum of

. . . . . Dollars

and . . . . . Cents

per cubic yard. ($ . . . . .)

Item 2. - Earth excavation for core walls and cut-off walls, the sum of . . . . . Dollars

and . . . . . Cents

per cubic yard. ($. . . . .)

Item 3. - For rock excavation, the sum of

. . . . . Dollars

and . . . . . Cents

per cubic yard. ($. . . . .)

DEC

CITY OF NEWBURGH, N. Y.

DAM CONSTRUCTION.

GENERAL SPECIFICATIONS.

Description of Work.

(1) The work to be done consists of constructing two adjacent dams across a branch of Silver Stream just northerly of the Washington siphon of the New York City Aqueduct. Both dams will have a maximum height above the present ground surface of about 22 feet, the spillway being 5 feet less than that figure. The easterly dam will in any case be constructed with an earth embankment and center concrete core wall which will extend about 4 feet into the solid clay and gravel beneath the dam. The spillway will be built on natural ground at the westerly end of this dam and there will be a small concrete gate chamber with a 48-inch gate valve on the blow-off pipe. On the westerly dam the soft material extends to a depth of from 12 to 20 feet below the surface of the ground and alternate bids are asked; Alternate A, for an earth dam with a concrete core wall similar to the easterly dam and which includes the excavation of all of the top material on the entire area included within the bottom slopes of the embankments; Alternate B provides for earth embankment and concrete core wall on the two ends of this dam where the soft material is not too deep and with the reinforced concrete section with earth backing on the portion where the depth of the soft material is at a maximum; Alternate C provides for an earth dam with a concrete core wall similar to Alternate A but ~~xxxx~~ northerly of that location. Specifications given herein shall apply to all similar work included

DEC

under this contract. For instance, earth excavation, Item 1, applies to all three sets of bids for the east dams, equally. The quantities o only are different and not the character of the work required. Item 10 for the east dam is the only one which does not apply to the other two bids.

Temporary and Protective Work.

(2) The Contractor shall furnish and install all temporary works for the protection and construction of the dam and its appurtenances during the construction of the work, including all cofferdams, flumes, bridges, etc., and shall do all ditching, etc., necessary to take care of the flow of water in the stream. The Contractor shall not have any claim for damages for any injury to the dam due to the inefficiency of the protective works or flumes or due to the overflow of water, or washing away of the dam, or any part thereof, except that in such case he shall receive an extension of time reasonably sufficient to make proper repairs and to replace material which has been washed away, all of which he shall do in a satisfactory manner and at his own expense. The prices bid under the various items in the proposal shall cover all work of a temporary or protective nature and shall include the cost of all such work.

Lines and Grades.

(3) All work shall be built in accordance with lines and grades shown on the plans and given by the Engineer. These lines and grades may be modified, as provided in the Contract. The Contractor will be required to furnish such material and render such

DEC

assistance as may be required for setting and preserving line and grade boards or stakes. He shall give at least 24 hours' notice in advance of his need of grades, lines, etc., to other than the usual extent. The Contractor shall accurately preserve all lines, grades, etc., of the work so staked until authorized to remove them.

Dimensions.

(4) Figured dimensions on the plans shall be given preference over scaled dimensions, but shall be checked by the Contractor before starting construction. Any errors, omission or discrepancies shall be brought to the attention of the Engineer and his decision thereon shall be final.

Inspection.

(5) The Contractor shall at all times provide convenient access and safe and proper facilities for the inspection of all parts of the work. No work, except such shop work as may be so permitted, shall be done except in the presence of the Engineer or his assistants. No material of any kind shall be used upon the work until it has been inspected by the Engineer. All materials rejected shall be immediately removed from the work and not again offered for inspection. Any materials or workmanship found at any time to be defective shall be remedied at once, regardless of previous inspection. The inspection and supervision of the work by the Engineer is intended to aid the Contractor in supplying labor and materials in accordance with the specifications, but such inspection shall not operate to release the Contractor from any of his contract obligations.

DEC

Proper Methods of Work and Proper Materials.

(6) The Engineer shall have the power in general to direct the order and sequence of the work, which shall be such as to permit the entire work to be begun and to proceed as rapidly as possible, and such as to bring the several parts of the work to a successful completion at about the same time. If at any time before the commencement or during the progress of the work the materials and appliances used or to be used appear to the Engineer as insufficient or improper for securing the qualtity of work required, or the required rate of progress, he may order the Contractor to increase their efficiency or to improve their character, and the Contractor shall conform to such order; but the failure of the Engineer to demand any increase of efficiency or any improvement shall not release the Contractor from his obligation to secure the quality of work or the rate of progress specified.

Boundaries of Work.

(7) The City will provide land or rights-of-way for the work specified in this contract, and the Contractor shall not enter or occupy with men, tools or materials any private ground outside the property of the City without the consent of the owner. Other Contractors and employees of the City may for all necessary purposes enter upon the work and premises used by the Contractor, and the Contractor shall give to other contractors and employees of the City all reasonable facilities and assistance for the completion of adjoining work.

Sunday and Night Work.

(8) No work shall in general be done between the hours of 6 p.m. and 7 a.m., nor on Sunday, except such as is necessary for

the proper care and protection of the work already performed, or except in case of an emergency and then only with the permission of the Engineer.

Work in Bad Weather.

(9) During freezing, stormy or inclement weather, no work shall be done except such as can be done satisfactorily and in a manner to secure first-class construction throughout.

Protection of Work.

(10) The Contractor shall place sufficient red lights on or near the work, and keep them burning from sunset to sunrise; shall erect suitable railingx or barriers, and shall provide watchmen on the work by day or night, as required and necessary for the safety of the work, the public and adjoining property. The City reserves the right to remedy any neglect on the part of the Contractor as regards the protection of the work which may come to its attention, after 24 hours' notice in writing except in cases of emergency, when it shall have the right to remedy any neglect without notice, and in either case to deduct the cost of such remedy from money due the Contractor.

Sanitary Regulations.

(11) Necessary housing conveniences for the use of the workmen for changing clothes and for protection during inclement weather shall be provided. Toilet accommodations properly secluded from observation shall also be erected and maintained by the Contractor in such manner and at such points as shall be approved and their use shall be strictly enforced. The work to be done under this contract is on the watershed of the water supply of Newburgh

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and all necessary precautions must be taken so that this water supply shall not be contaminated, Ample toilet, out-house or privy accommodations shall be furnished and their use by the workmen shall be strictly enforced. Workmen found using other than arrangements provided shall be summarily discharged from the work. If necessary such accommodations shall be provided with watertight boxes or other receptacles which shall be removed and their contents buried where directed outside of the watershed limits. The Contractor shall obey and enforce such other sanitary regulations and orders and shall take such precautions against infectious diseases as may be deemed necessary. In case any infectious disease occurs among his employees he shall arrange for the immediate removal of the patient from the work and his isolation from all persons connected with the work. The building of shanties or other structures for housing the men, tools, machinery or supplies will be permitted only at approved places, and the sanitary condition of the grounds in and ~~xxx~~ at such shanties or other structures must be at all times maintained in a satisfactory manner.

Care of Existing Structures.

(12) The Contractor shall properly care for and maintain any existing structures on or adjacent to the work which may be encountered during the construction and shall be liable for any damage done to such structures through his negligence or carelessness. The Contractor shall replace in a satisfactory manner any structures necessarily removed during the performance of his work.

Removal of Temporary Structures.

(13) On or before the completion of the work the Contractor shall, without charge therefor, tear down and remove all buildings

and other structures, built by him for facilitating the carrying out of the work, and shall remove all rubbish of all kinds from the buildings and grounds which he has occupied, and shall leave the work clean and in good condition.

ITEM 1.

EARTH EXCAVATION INCLUDING STRIPPING EXCEPT CORE WALL AND CUT-OFF WALL EXCAVATION.

Extent.

(14) Under this item the Contractor shall remove from within the limits of the work all rubbish, stumps, fences, refuse and other material which shall be piled up and burned or otherwise satisfactorily disposed of. He shall remove the top soil from places where embankments are to be made or elsewhere as directed by the Engineer and to such depths as is required and pile the same compactly for subsequent use on the dam or embankment as required. If not suitable for dam construction or not used on embankments it shall be trimmed neatly to lines given. Such other material as is not suitable for being placed in embankment shall be excavated to the lines and grades given and removed to one side where directed, either in piles or in fills upon adjoining land. Any necessary sheeting, supporting, pumping or transporting required for making the excavation and disposing of the material will be paid for per cubic yard under Item 1.

Measurement.

(15) Work under this item will be measured to the lines and grade given and shall include excavation of any character except that from burrow pits or in hard material for cut-off walls, core walls, spillways, etc.

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Completion.

(16) The price bid per cubic yard shall include all stripping, clearing and grubbing, the removal of top soil and the disposal of all excavated material unless used in embankment, such used material being paid for both as excavation and embankment. The bidding price shall include all necessary sheeting and supporting, pumping and transportation required for making the excavations and disposing of the material except excavated material used in embankment.

ITEM 2.

EARTH EXCAVATION FOR CORE WALLS AND CUT-OFF WALLS.

Extent.

(17) Excavation for the trench for core walls, for the trench for the blow-off pipe and other excavation in firm material shall be made to the lines and grades given at the time of construction and substantially as shown upon the drawings.

Disposal of Excavated Material.

(18) The surplus material from the trenches shall be spread in thin layers upon the site of the embankment and thoroughly compacted or rolled. All backfilling around the core-wall and pipe lines shall be thoroughly made with the best of the material placed in layers not over four inches thick compactly rammed.

Unauthorized Excavation.

(19) The excavation shall be carried to such depths as the Engineer shall determine upon the ground, but in case the Contractor excavates beyond or below the lines and grades given, the Contractor

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shall, at his own expense, refill such unauthorized space with concrete, as specified for the core wall, or with other approved material.

Removal of Water.

(20) The Contractor shall provide a suitable plant with which to remove the water promptly from the excavations and keep them dry until the structures to be built therein are completed and the concrete is sufficienty set to allow the water to come upon it.

Sheathing.

(21) All necessary sheathing, shoring, bracing or other supports to maintain the sides of the excavatuons or to exclude water shall be furnished and placed by the Contractor. Unless otherwise required such sheathing and bracing shall be removed, and all vacancies left shall be filled and thoroughly rammed.

Measurement.

(22) Excavation for ~~xx~~ trenches will be measured as 1-1/2 feet wider than the bottom of the structures or the outside of the barrel of the pipe and to the bottom of the core wall or to rock or to the bottom of the barrel of the pipe as the case may be. Material from the trenches placed in the embankment of the dam will be measured and paid for as embankment.

Compensation.

(23) The price bid pe. cubic yard under this item shall include the excavation of all material except rock; the backfilling of the trench, the disposal of all surplus material in the earth embankment or otherwise as directed, the furnishing of all machinery, tools, labor, drainage, sheathing, bracing and appurtenances necessary to complete the work.

DEC

ITEM 3.

ROCK EXCAVATION.

Extent.

(24) It is not the intention to excavate for the core wall any large amount of sound rock, but the Contractor shall excavate where so required such rock as may be necessary in order to secure a firm and uniform foundation for the core wall. He shall under this item excavate and dispose of in a neat and satisfactory manner, outside of the embankment, all material which cannot be handled with picks and shovels with reasonable facility. For this material and for all boulders of one-half cubic yard volume or more excavated from the trenches and disposed of the Contractor will be paid the price bid under Item 3. Rock excavation will be measured to the outside lines of the structures and to the depths excavated as directed.

ITEMS 4 AND 5.

CONCRETE.

Extent.

(25) Under these items the Contractor shall furnish all materials and shall lay all concrete masonry necessary in any part of the work as shown or required. Under Item 4 there shall be included the core wall and all other concrete in which reinforced rods are not shown on the drawings. If during construction, reinforcing steel is ordered in any such walls, concrete shall not be paid for under Item 5 but under Item 4, and reinforcing steel so ordered paid for under Item 6. Item 5 includes the reinforced dam section under Alternate B, if constructed, the gate house superstructure and any other concrete shown as reinforced concrete on the drawings.

DEC

Cement.

(26) Portland cement of reputable brands shall be used throughout the work. Notice shall be given to the Engineer of the delivery of shipments of cement so that sealed cars may be inspected or so that samples may be obtained for testing. Each shipment must be stored separately, until accepted. All cement shall conform strictly to the requirements of the lastest Standard Specifications for cement of the American Society for Testing Materials.

Cement Tests.

(27) All cement used on the work shall be tested by an approved testing laboratory. The Contractor shall at his own expense, furnish certified laboratory tests of each shipment showing that the cement conforms to the above specifications. Shipments shall be made in sealed cars which shall only be opened in the presence of an inspector. The City reserves the right to make such additional tests as may be deemed desirable, but such tests will be made at the expense of the City.

Volume of Cement.

(28) For the purpose of determining the amount of cement for a given concrete mix proportioned by volume, one sack of cement, weighing 94 pounds net, will be considered as one cubic foot of volume.

Storing Cement.

(29) Cement shall be stored in weatherproof buildings having wooden floors raised above the ground. Stock shall be kept on hand at all times to allow ample time for testing and to guarantee

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a sufficient amount for the prosecution of the work. Lumpy or partially set cement shall not be used and must be removed from the work.

Sand.

(30) Sand for concrete and mortar shall be clean, coarse, sharp silica sand containing not more than 5 % of clay or loam and ffee from any organic matter coating the grains. All of the particles must pass a 1/4-inch mesh sieve; not more than 30 % by volume shall pass a No. 50 sieve, and not over 6 % shall pass a No. 100 sieve.

Stone or Gravel.

(31) The coarse aggregate for concrete shall consist of well-grained crushed stone or washed, screened and graded gravel, substantially free from dust, clay or loam. The aggregate shall be uniformly graded from a minimum of particles held on a one-quarter inch mesh sieve to a maximum of particles passing a one and one-half inch mesh sieve. It must not contain flat or elongated pieces and must be hard and durable. For very thin sections the maximum size of particles may be less than one and one-half inches, subject to approval by the Engineer.

Water.

(32) Water used in concrete and for other purposes shall be reasonably clean and shall be free from oils, acids, or sewage contamination and must be furnished at the Contractor's expense.

Forms.

(33) The Contractor shall at his own expense provide suitable forms and centers with smooth surfaces; tight, strong and rigidly braced and tied. The bracing shall be ample to prevent

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deviation from the correct lines. No form shall be used which is not clean and of proper shape and strenght and in every way suitable. Deformed, broken or defective forms shall be removed from the work. All forms shall be cleaned and wetted before using. Forms shall be so constructed as to permit the ready inspection and cleaning of the spaces to be filled with concrete. Surfaces of forms in contact with concrete shall, if required, be coated with an approved non-adhesive substance. The Contractor shall furnish a sufficient number of forms so that the work may be prosecuted rapidly; and if at any time the proper rate of progress is retarded by lack of forms, additional forms shall be provided.

Removal of Forms.

(34) No forms shall be removed until the concrete has sufficiently set, and then only with the permission of the Engineer. After removal of forms, all wires and rods used for tying the forms shall be promptly cut just beneath the surface of the concrete, and the holes pointed with cement mortar before the concrete has fully set.

Proportions of Concrete.

(35) All concrete shall be composed of one part cement, two and one-half parts sand and five parts broken stone or gravel. The sand and broken stone or gravel shall be measured separately and the relative amounts of each taken to make up the seven and one-half volumes of sand and broken stone or gravel to one volume of cement may be varied slightly by the Engineer in order to produce the best results for the purpose intended without changing the total volume of the aggregate with respect to the volume of the cement. The Contractor shall make such variation without additional expense to the City.

DEC

Mixing.

(36) Concrete shall be mixed by an approved batch machine in all cases except where, for small quantities, the Engineer may permit hand mixing. The use of continuous mixers will not be permitted. Adequate arrangements shall be made which, for each batch, will provide for the correct measurement of each of the ingredients before placing in the mixer, the mixing of the ingredients dry and the introduction of a measured quantity of water at any stage of the process. Mixing shall be continued through 12 or more complete revolutions of the drum, and for at least one and one-half minutes in any event. Every particle of stone or gravel shall be completely covered with mortar. No concrete shall be put in place after its initial set has taken place, and no re-temepered concrete shall be used under any conditions. The mixtures shall be plastic or moderately wet, and no excessively wet nor very dry concrete will be permitted. Whenever work is permitted by the Engineer at a time when freezing is possible, water, sand and stone shall be heated.

Placing.

(37) After mixing, the concrete shall be transported rapidly and deposited in place. It shall be carried up level along the whole length of the section under construction, and shall be so placed as to avoid rehandling within the forms. It shall be spaded or rammed into place and shall be thoroughly compacted around reinforcement, pipes or other shapes built into the work. On the surface of walls the concrete shall be spaded so as to bring rich mortar to the face. No concrete shall be deposited in water and water shall not be allowed to rise upon or flow over masonry until it has properly set.

DEC

Concrete to be Solid and Compact.

(38) Special care shall be taken to place the concrete solidly against the forms so as to leave no voids. Every precaution shall be taken to make all masonry solid, compact, watertight and smooth. If for any reason the surfaces have voids, or are unduly rough, or are in any way defective, such masonry shall be cut out and properly replaced, if required. In case of slight imperfections the concrete may, if permitted, be plastered with one to two cement mortar, well forced into the imperfect concrete so as to make watertight work, and floated to give a neat appearance.

Watertightness of Concrete.

(39) Concrete masonry built under this contract shall be practically watertight, and every precaution shall be used to obtain watertight work. Any cracks or imperfections which develop in the course of the work shall be thoroughly repaired.

Joints and Bonding.

(40) Joints in concrete shall be made only at such points as shown, or as shall be directed or permitted by the Engineers, who will locate the joints with reference to the stability, strength and watertightness of the masonry. Before proceeding with the laying of any section of concrete the joints shall be located and all form work, bulkheads and reinforcement for that section shall be in place.

Joints shall be made of such dimensions as are shown upon the drawings, or as directed, and shall have keys or grooves which shall be continuous and straight or regular. Where the details of joints are not shown on the plans the direction of the Engineer shall be carefully followed as to their section and location. At joints, the surfaces against which new concrete is to be laid shall be

thoroughly cleaned and wetted, so as to give a satisfactory bond with the new concrete, and shall be covered with a thick bed of mortar. Whenever work is topped for a time sufficient for the concrete to set, approved keyways or steps shall be formed.

Care of New Concrete.

(41) All exposed surfaces of finished and unfinished concrete shall be kept constantly moist by sprinkling with water at short intervals, by covering with moistened burlap, or by such other means as may be approved, until the permanent covering is in place or until in the opinion of the Engineer the concrete is sufficiently hardened. No exposed work shall be laid during rain storms, and freshly laid concrete shall be protected during storms to prevent the water from washing it. Sufficient covering shall be provided and ~~kept~~ kept ready at hand for this purpose. All fresh work shall be carefully protected from injury in every way. No wheeling or walking on it shall be permitted, and any portion injured shall be replaced by the Contractor at his own expense.

Surfacing.

(42) All exposed surfaces of walls and other concrete work shall be rubbed smooth with mortar blocks and water, or otherwise treated so as to present a neat appearance. The bottom of the spillway channel shall be screeded and troweled to a smooth and uniform surface.

DEC

Measurement.

(43) Concrete will be measured as of the volume actually placed within the limits directed. No deductions will be made for steel reinforcement or steel beams, for small projections of rock, or for openings less than one square foot in corss section.

Payment.

(44) The prices bid per cubic yard under Itesm 4 and 5 shall include all labor, tools and material required to construct and surface the concrete complete as specified, to test the various structures, to place minor fixtures in the concrete and to do any necessary cutting and fitting.

ITEM 6.

STEEL REINFORCEMENT.

Extent.

(45) Under Item 6 the Contractor shall furnish and lay in the concrete of Item 5 such steel reinforcement as shown on the drawings or as may be directed. Structural steel beams or shapes are not included in this item.

Quality.

(46) Steel reinforcing bars to be embedded in concrete shall be square corrugated, twisted or deformed bars of the sizes called for on the plans and of a form approved by the Engineer. Bars shall be free from defects and kinks and from bends that cannot be readily and fully straightened in the field. Bars shall be rolled from open hearth steel billets (not re-rolled material) and

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shall have an ultimate strength of 55,000 to 65,000 pounds per squre inch, an elastic limit of not less than one-half the ultimate strength. Test specimens shall bend cold through an angle of 180 degrees to their own diameter. Tests shall be made if necessary in the opinion of the Engineer upon the finished bars as furnished for the work under this contract, and test certificates furnished; at least one tensile and one bending test being made from each 1,000 pounds of bars furnished. All bars shall be free from rust scale or more than a very thin coating of red rust resulting from short exposure, or will be rejected and shall be removed from the premises upon the order of the Engineer. All bars shall be stored in a clean, dry place until incorporated in the work.

Placing.

(47) All reinforcement shall be thoroughly cleaned, and no reinforcement having rust scale or more than a very thin coating of red rust shall be used. Particular care shall be used to place the steel accurately in its proper location and position in the cross-section. The steel shall be bent accurately to the forms shown, and whenever required bent or hooked at the ends. All reinforcement shall be securely held in place in a satisfactory manner, and bars shall be wired together at intersections as often as necessary. Adjoining bars at splices shall overlap at least 40 diameters. Where necessary and directed, and particularly where steel is to be placed in the tops of slabs, adequate steel chairs or supports shall be provided, and will be included for payment under Item 6.

Measurement and Payment.

(48) The weight of steel reinforcement will be computed in pounds upon the basis of 489.6 pounds per cubic foot for the

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lengths and cross sections specified or ordered. Actual weights shall not be more than 5 per cent. less than the theoretical computed weights. The weights of tie wires and other supports will not be included, except those of chairs, clamps, etc., shown or ordered to be placed. No allowance will be made for laps or for waste except where laps are specifically shown upon the plans. The price bid shall include all labor, materials and appliances for furnishing, testing, bending and placing reinforcement, for securing it in place, and thoroughly embedding it in the concrete.

ITEM 7.

EARTH EMBANKMENT.

Extent.

(49) The Contractor shall make the embankment for the dams substantially as shown upon the drawings, using material obtained from borrow pits and from the excavation made for the various parts of the dams and appurtenances.

Borrow Pits.

(50) The borrowed material for the embankment shall be obtained from the grounds of the City in the location directed and not exceeding 1000 feet distant from the nearest part of the dam.

Material on the Upstream Side.

(51) The earth used in making the embankment on the upstream side of the core wall shall be the most suitable and watertight clayey material found, free from stones larger than four inches in diameter.

DEC

Rolling.

(52) The materials for both sides of the dam shall be placed in layers not over six inches thick. Each layer shall be thoroughly rolled with an approved heavy grooved roller weighing not less than 1,000 pounds per lineal foot, or by a steam roller. Where the roller cannot reach, the material shall be placed in the same manner and thoroughly rammed. Sufficient water shall be used hwere directed to secure a close connection between the layers and the close compacting of the material. The embankment shall be carried up equally on both sides of the core wall, but shall always be kept somewhat below the top of the wall. The embankment beneath the spillway channel shall be completed as early as possible, and especial care shall be used to prevent after-settlement.

Over-Fill.

(53) Embankments shall be filled for a distance of four to six inches horizontally outside of the neat lines shown upon the plans, and afterwards shall be trimmed to the correct lines and grades. The outer slope where exposed shall then be covered with top soil to such depth as directed, depending upon the amount of material available therefor.

Embankment of Blow-Off.

(54) At the place where the blow-off pipe line is to be carried through the dam the earth embankment shall be made to a height of at least one foot over the pipe line before the pipe line is laid, and the trench shall then be excavated as provided under Item 2.

DEC

Embankments to be Uniform.

(55) The work shall be so carried out that no places too steep to be rolled shall be left in the embankments, and all abrupt changes in grade necessitated by the building of bridges or flumes shall be leveled off so that they can be thoroughly rolled.

Measurement.

(56) All embankments will be measured in place after compacting, trimming and settlement, regardless of the source of the material. In order to allow for settlement, embankments will not be measured for final estimate in any case within 30 days after their completion.

Compensation.

(57) The price bid per cubic yard for earth embankment shall include the filling of the embankment above the stripped surface of the ground, the overfilling and trimming of the banks; the grading of the surface; and rolling, compacting and watering; and all labor, materials, tools, and appurtenances necessary to complete the work.

ITEM 8.

PAVING.

Extent.

(58) On the up-stream slope of the dam as shown upon the drawings, and at other places as required, the Contractor shall lay stone paving.

DEC

Description.

(59) The stone shall be hard, durable stones, quarried from the vicinity of the work, or shall be others at least equal to them. They shall be of the average depths shown upon the plans or as directed and shall have a face area of approximately one square foot or more. They shall be laid compactly together, without any spaces larger than 3 inches; and all of these spaces shall be completely filled up with spalls and broken stone. The paving shall be placed by hand carefully to grade and shall be settled into place with a heavy rammer. Especial care shall be used to place solidly the stones at the toe of the embankment, and the largest stones shall be used for this purpose.

Measurement and Compensation.

(60) The stones shall be measured in place for the area covered at the average depth shown on the plans or directed to be laid. The price per square yard bid shall include the furnishing and placing of the paving, and all labor, tools, and appurtenances necessary to complete the work.

ITEM. 9.

BROKEN STONE OR GRAVEL.

Extent.

(61) Under Item 9 the Contractor shall furnish and place broken stone for foundations and elsewhere if required. The stone shall be of good quality, of the size required for concrete masonry, placed as directed and thoroughly rolled and brought accurately to the proper grade.

DEC

Measurement and Compensation.

(62) Broken stone for foundations will be measured in place, for the volume actually ordered and placed within the limits directed. The price bid per cubic yard under Item 9 shall include all materials, labor, tools and appurtenances necessary in order to furnish and place the stone as specified.

ITEM 10.

BLOW-OFF, PIPING, VALVE, GATE HOUSE SUPERSTRUCTURE, FOOT BRIDGE AND APPURTENANCES.

Extent.

(63) Under this item the Contractor shall do all work and furnish all materials for laying the 48-inch outlet pipe, the 48-inch geared valve, the superstructure of the gate house and the foot bridge from the gate house to the dam, complete, with all appurtenances such as ladders, hardware, etc. Concrete, excavation, paving and embankment are included under other items.

Outlet Pipe.

(64) The cast-iron pipe and the special castings at the core wall shall be made in all respects in accordance with and shall meet the requirements of the standard specifications for cast-iron pipe and special castings of the American Water-Works Association for Class A. The Contractor, may however, use standard patterns having other dimensions than those given in the American Water Works specifications provided that the pipes and special castings are in all respects equal to those of the American Water-Works specifications and the patterns are approved in writing. All joints shall be made with soft and malleable lead and with a gasket of the best quality of hempen yarn or jute closely twisted into one piece for each jpint.

DEC

Bottom of Trench for Pipe.

(65) The trench shall be excavated under Item 2. The bottom of the trench shall be excavated to the shape of the pipe and so that the pipe shall have a firm bearing for its full length upon the earth. Where the earth beneath the pipe is unsuitable for foundation it shall be excavated to such greater depth as is necessary and refilled compactly with selected earth paid for under Item 7. At joints the trench shall be of such width and depth as to permit the joints to be properly made.

Laying Pipe and Valve.

(66) The Contractor shall provide suitable tools and appliances for properly handling and laying the pipes and valve. Great care shall be taken to prevent the tar coating from being injured, particularly on the inside of the pipes. The pipes shall be carefully examined for defects before laying so that no defective pipe shall be laid; but if such pipe should be laid it shall be removed and properly replaced at the expense of the Contractor.

Joints.

(67) The spigot of the pipe shall be properly seated in the socket of the next adjacent pipe so as to provide a uniform joint space. The gasket shall be driven hard into the socket so as to leave a depth of lead of at least two and one-half inches. The furnace and melting pot shall be kept near the joint to be poured and no dross shall be allowed to accumulate in the pot. The entire joint shall be filled at one pouring unless otherwise permitted.

DEC

Calking.

(68) All joints shall be made by experienced pipe jointers and calkers and the calking shall be thoroughly done so that the lead after being calked shall be uniformly compressed and slightly set back from the face of the bell of the pipe. No calking with cold lead will be permitted.

Cutting.

(69) Whenever pipes require cutting to fit into the line, the cutting shall be done so as to leave a smooth end at right angles to the axis of the pipe.

Valve.

(70) The valve shall be a gate valve of the double seat type, having a non-rising stem and a water-way of the full nominal diameter. It shall be bronze mounted and all bearing surfaces shall be of bronze or faced with bronze. Gate and seat rings shall be properly dove-tailed into place, or the seat rings may be screwed into place if desired. The cast-iron and the coating of the valve shall be equal to that specified for cast-iron pipe. The valve shall be tested at the shop and made tight under a pressure of 50 pounds per square inch.

DEC

Gate House Superstructure.

(71) All bricks shall be sound, hard, well burned, of uniform size and color, and with straight unchipped edges. Bricks shall be wet before laying and shall be laid in full beds of mortar with end and side joints made at one operation. The best of the bricks shall be selected for the outer faces. Joints shall not exceed 3/8-inch in thickness and shall be neatly struck. Courses shall be laid level, true, straight and plumb and shall correspond with sill,s lintels, and cornices after splitting. Every fifth course shall be of headers. The brick work shall be suitably protected from the weather during construction and after completion shall be cleaned down.

Brick masonry shall be laid in a mortar of one volume of Portland cement, one volume of slaked lime and four volumes of screened sand and thoroughly mixed together with sufficient water. The cement shall conform to the requirements specified under concrete. Mortar used in exposed faces shall be stained to match the color of the brick.

Sills and lintels for the door and window shall be of reinforced concrete, or of a hard, durable, approved stone. They shall be finished or dressed so as to give a neat appearance.

Lumber for floors and for roof framing shall be of good quality yellow pine and shall be surfaced where exposed. It shall be framed in a neat manner.

The door shall be a substantially built panelled door 2-1/2-inches thick set in a heavy rabbetted door frame anchored to the masonry. All necessary hardware shall be furnished including suitable bronze hinges, latch and lock.

DEC

Double hung windows shall be provided and set. The box frames shall be of white pine or poplar built in the best manner and anchored to the masonry. The sash shall be 1-3/4 inches thick of clear white pine, mortiese, tenoned and pinned in a first-class manner. Pulleys, weights, sash cord and a sash-fast shall be furnished. Wooden shutters with substantial iron hinges fastened to the brick work shall be furnished and placed on the outside of the window. The shutters shall be arranged to be fastened from the inside.

A suitable iron ladder, or set of iron manhole steps from the floor to the bottom of the chamber shall be furnished and placed.

All exterior and interior wood work except the floor shall be finished for painting and shall be painted in an approved manner with three coats of lead paint mixed in pure linseed oil and colored as directed. All iron work and tin shall also be painted with three coats of approved paint.

Roof.

((72) The roof sheathing shall be covered with suitable roofing felt and with asbestos shingles or slate, satisfactory to the Engineer. The hips shall be flashed with 20-ounce copper properly secured.

Foot Bridge.

(73) The foot bridge from the gate house to the top of the dam shall be built of 10-inch, 25-pound steel I-beam resting on a concrete support at the dam as shown on the drawings. Pipe railings shall be two inch galvanized iron with posts securely fastened to the I-beams. The flooring shall be of 2-inch yellow pine painted with 3 coats of satisfactory lead and oil paint.

Compensation.

(74) The lump sum bid for the superstructure of the gate house, foot bridge and outlet pipe and valve shall include the furnishing of all materials and the erection and installation of the work complete as shown on the plans or specified, except excavation, embankment, concrete, and paving which shall be paid for under other items.

DEC

STATE OF NEW YORK

COMMISSIONERS
ALEXANDER MACDONALD
CONSERVATION COMMISSIONER
CARL SHERMAN
ATTORNEY-GENERAL
DWIGHT B. LA DU
STATE ENGINEER AND SURVEYOR

DWIGHT B. LA DU
STATE ENGINEER AND SURVEYOR
CHAIRMAN
ALBERT H. PERKINS
DIVISION ENGINEER
SECRETARY
RUSSELL SUTER
SENIOR ASSISTANT ENGINEER
DEPUTY OF THE COMMISSION
IN WATER SUPPLY MATTERS

WATER CONTROL COMMISSION
ALBANY

June 14, 1923.

Water Supply Application No. 283.

Hon. Dwight B. LaDu,
State Engineer and Surveyor,
Albany, N. Y.

Dear Sir:-

On May 31, 1922, the Water Control Commission approved a water supply application from the city of Newburgh, which, among other things, provided for the construction of a storage reservoir on Silver Stream. In approving this application one of the conditions imposed read as follows:

> 2. Complete detailed plans and specifications for all work in connection with the storage and diversion of water from Silver Stream and Patton Brook shall be submitted to this Commission for its approval prior to the beginning of construction of any such works and thereafter such works shall be completely constructed in strict accordance with plans and specifications which have been so submitted and approved.

In conformity with this condition Messrs. Fuller and Harding, Engineers for the city, have filed plans and specifications showing the proposed dam on Silver Stream. At my request these plans and specifications were submitted to this office in duplicate, but an application for approval of the dam as such is to be sent directly to you. Herewith I am forwarding one set of plans and specifications for your files; the other set has been filed as part of the water supply application.

The plans filed show several different locations for the dam. It is my understanding that "Alternate C" has been adopted and that it is satisfactory to the City of New York. You will note that this dam is immediately upstream from the Washington Square siphon of the Catskill aqueduct belonging to New York City. This siphon consists of three steel pipe lines, the steel being embedded in concrete. It is my understanding that this siphon is now complete.

DEC

GEORGE W. FULLER, C. E.
JAMES C. HARDING, C. E.
CONSULTING ENGINEERS
170 BROADWAY
NEW YORK

D. W. HOWES
NEWBURGH, N. Y.

D

June 28, 1923.

Mr. Dwight B. LaDu,
State Engineer & Surveyor,
Albany, N. Y.

Dear Sir:

There has been considerable delay in getting to you the plans and application for the proposed dam at Newburgh, this being due first to lack of funds which has only recently been taken care of by the City, and second, the desire to build the West Dam close to the New York City Aqueduct as called for in Alternate C of the plans. This method was that desired by the New York City water departments and by us, but the time it would take to get a permanent lease or easement of the necessary land would have caused us great delay, and we now propose to build a concrete dam entirely on land owned by the City of Newburgh, that is in accordance with the extra sheet sent you showing Alternate D.

If there is any further data or information that would be helpful, we would be glad to send it to you immediately.

Very truly yours,

James C. Harding

DEC

F3-39

GEORGE W. FULLER, C. E.
JAMES C. HARDING, C. E.
CONSULTING ENGINEERS
170 BROADWAY
NEW YORK

D. W. HOWES
NEWBURGH, N. Y.

D

June 28, 1923.

Mr. Dwight B. LaDu,
State Engineer & Surveyor,
Albany, N. Y.

Dear Sir:

We are enclosing an application for the construction of a dam for the City of Newburgh in accordance with the plans submitted to the State Water Control Commission and as presented by them to your Department.

Silver Stream now discharges to Washington Lake by a canal through the Divide between those two watersheds. The entire watershed area of Silver Stream thus made tributary to Washington Lake, being 4.7 square miles. The only storage of the Newburgh supply is at Washington Lake and while this is something over one billion gallons, there are times when this storage is not sufficient to take all water from Silver Stream and it is to conserve this water that the reservoir is being constructed.

A reservoir of the size and capacity proposed is an over-development of the watershed tributary, but this is done with the idea that when necessary a part of the Drury Lane stream lying westerly of the Silver Stream valley will be taken into the Silver Stream watershed by a tunnel as indicated by the blue line on the U.S.G.S.Sheet No. 195.

Cross sections of the reservoir have not been completed and therefore it is not know exactly what the capacity of the reservoir will be, but it is estimated that it will hold about one-half billion gallons of water with the spillway at elevation 361.5 as shown on the plans.

The watershed is mostly farming and meadow land and soil for the most part is the characteristic gravel and clay mixture usual in that district.

At the site of the dam the material underlying the top soil and muck is a very compact hard gravel with some clay, entirely impervious to water and the entire length of the dam will rest on that material.

The location of this dam is directly south of the Catskill Aqueduct on land purchased by the City of Newburgh. U. S. G. S. Sheet 195 shows the Aqueduct located somewhat southerly of its actual location as indicated by the pencil line.

The construction of this dam where indicated by the red mark will raise the water in this valley to such a height that it will overflow immediately westerly of this dam at the place where

DEC

the dam called the "West Dam" on the plans will be located and also about 2-1/2 miles southerly where the highway crosses the valley as indicated by the yellow mark on the topographical sheet. At this point it will be necessary to raise the highway about 4 feet above its present elevation, forming an embankment at that point to prevent the water flowing southerly. The U.S.G.S. Topographical map is entirely incorrect as regards this district.

The easterly dam will be constructed of earth with a concrete core wall and a concrete spillway discharging to the culvert beneath the Catskill Aqueduct where the latter crosses Silver Stream. The westerly dam will be partly of concrete and partly an earth dam with concrete core wall. This part of the work is more costly and difficult than the easterly dam as hard material here is over-laid by from 10 to 20 feet of muck, and this has to be taken out before any new construction work can be done.

The details of the work are shown on the plans previously sent you and the extra sheet mailed to you under separate cover today which shows the east dam as we now propose to construct it. These plans and the data given in the application for the construction of the dam give full information concerning it. If, however, there is anything else that is required, we will be glad to furnish it to you quickly or if you desire to make an inspection of the dam location, we would be glad to meet your engineers at such date as would be convenient.

Very truly yours,

James Lefferding

DEC

3-18-22-1000 (6-2749)

STATE OF NEW YORK
DEPARTMENT OF
State Engineer and Surveyor
ALBANY

Received July 2nd 1923 Dam No. 531 Lower Hudson Watershed

Disposition Approved July 3rd 1923 Serial No. 518

Site inspected

Foundation inspected

Structure inspected

RECEIVED STATE ENG. JUN 30 1923 REF'D TO ANS'D

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the State Engineer, Albany, N. Y., in compliance with the provisions of Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22 as amended, for the approval of specifications and detailed plans, marked

herewith submitted for the {construction / reconstruction} of a dam located as stated below. All provisions of law will be complied with in the erection of the proposed dam.

1. The dam will be on the south branch of Silver Stream in the town of New Windsor, County of Orange and about 100 feet southerly of the Catskill Aqueduct
(Give exact distance and direction from a well-known bridge, dam, village, main cross-roads or mouth of a stream)

2. The name and address of the owner is City of Newburgh

3. The dam will be used for a public water supply

4. Will any part of the dam be built upon or its pond flood any State lands? No

5. The watershed at the proposed dam draining into the pond to be formed thereby is 1.36 square miles.

6. The proposed dam will have a pond area at the spillcrest elevation of about 300 acres and will impound about 67,000,000 cubic feet of water.

7. The lowest part of the natural shore of the pond is (see note) feet vertically above the spillcrest, and everywhere else the shore will be at least (see note) feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was about 60 cubic feet per second on X (Date)

9. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam Probably not

10. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) a very compact mixture of gravel and clay

DEC

clay mixture

11. The material of the right bank, in the direction with the current, is gravel and/ at the spillcrest elevation this material has a top slope of 3 inches vertical to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of 5000 feet, and the top surface extends for a vertical height of 100 feet above the spillcrest.

clay mixture

12. The material of the left bank is gravel and/ has a top slope of 1½ inches to a foot horizontal, a thickness of 7000 feet, and a height of 70 feet.

13. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. uniformly impervious compact mixture of gravel and clay

14. If the bed is in layers, are the layers horizontal or inclined? x If inclined what is the direction of the slope relative to the center line of the dam and the inches vertical to a foot horizontal? x

15. What is the thickness of the layers? x

16. Are there any porous seams or fissures? no

17. WASTES. The spillway of the above proposed dam will be 30 feet long in the clear; the waters will be held at the right end by a earth dam the top of which will be 5 feet above the spillcrest, and have a top width of 15 feet; and at the left end by a natural gravel the top of which will be 5+ feet above the spillcrest, and have a top width of 15+ feet.

18. There will be also for flood discharge a pipe 48 inches in diameter and the bottom will be 16½ feet below the spillcrest, a sluice or gate 4 feet wide in the clear by 4 feet high, and the bottom will be 16½ feet below the spillcrest.

19. APRON. Below the proposed dam there will be an apron built of concrete, 300 feet long, 15 to 30 feet wide and 1 feet thick. The downstream side of the apron will have a thickness of feet for a width of feet.

20. PLANS. Each application for a permit of a dam over 12 feet in height must be accompanied by a location map and complete working drawings of the proposed structure. Each drawing should have a title giving the parts shown, the name of the town and county in which the dam site is located, and the name of the owner and of the engineer.

The location map (U. S. Geological Quadrangle or other map) should show the exact location of the proposed dam; of buildings below the dam which might be damaged by any failure of the dam; of roads adjacent to or crossing the stream below the dam, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground.

DEC

The complete working drawings should give all the dimensions necessary for the calculations of the stability of the structure, and all the information asked for below under "Sketches." There may be attached to the plans any written reports, calculations, investigations or opinions that may aid in showing the data and method used by the designer.

21. SKETCHES. For small and unimportant structures, if plans have not been made, on the back sheet of this application make a sketch to scale for each different cross-section at the highest point; showing the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spill at 18 inches below the crest), the elevation of the top in reference to the spillcrest, the length of the section, and the material of which the section is to be constructed. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; and the abutments by their top width and top lengths from the upstream face of the spillcrest and give the elevation of the top in reference to the spillcrest.

22. ELEVATIONS. Also give the elevations, if possible from the Mean Sea Level, of at least two permanent Bench Marks; of the spillcrest for any existing dam on the proposed dam site, at the middle and at both ends of the spill; and of the spillcrest for the above proposed dam.

23. SAMPLES. When so instructed, send samples of the materials to be used in the construction of the proposed dam, using shipping tags which will be furnished. For sand one-half a cubic foot is desired; for cement, three pints; and for the natural bed, twenty cubic inches.

24. INSPECTION. State how inspection is to be provided for during construction.....by a.....
resident engineer and necessary inspectors

DEC

Note: The capacity of the reservoir given in Section 6 is approximate as full cross-sections have not been completed.

At two places the natural shore of the pond would be lower than the spillcrest elevation, one of these just westerly of the dam crossing Silver Stream where a masonry dam is to be built and also at the southerly end of the reservoir where the highway is to be raised some 4 feet to form an embankment.

Stream flows at this point were only taken to show the comparative value of this part of the watershed with other parts, the highest reading that we had was about 60 cubic feet per second this last spring. It is of little value when estimated on maximum run-offs. The two ends of the dam are built into and against the side of quite extensive hills which rise considerably higher than the stream bed and are higher for a distance of more than a mile.

The above information is correct to the best of my knowledge and belief.

170 Broadway, New York City
(Address of signer)

June 28, 1923
(Date)

Engineer for City of Newburgh, N.Y.
(A person signing for Applicant should indicate his title or authority).

PEC

Copy.

ARMcK/F.

Dam 531,Newburgh, L.Hudson.

July 7, 1923.

Mr. W. Johnston McKay,Mgr.,
Newburgh,N.Y.

Dear Sir:

We have received from your engineers an application, report of June 28th, and blue prints No. 2, 4, 5, 6 and 9 for the construction for the City of Newburgh of an east embankment dam on the south branch of Silver stream in the Town of Windsor, County of Orange, which dam we have designated on our records as No. 531, Lower Hudson Watershed.

We will require that the outlet and the spillway channel rest throughout on natural ground; that, if the excavations made in the bed are entirely refilled with well tamped concrete, they be carried perpendicular to the surface of the ground into an impervious and compact earth foundation bed and banks equal to at least 3 ft. plus 1/3 the depth below the proposed upstream highest water surface; that the embankments and the spillway channel be protected by paving wherever they may be subject to any wave or current action; that your engineer submit a report on the bed and banks as soon as the excavations are made, stating the character of the material, the compactness and the imperviousness, and if any pervious strata are found, a report by your engineers should be sent to this office at once, giving the location and the direction relative to the upstream edge of the spillway crest of the horizontal outcrop of the top of such strata, the angle and direction of such strata from the horizontal in a plane perpendicular to the above horizontal outcrop, the perpendicular thickness of such strata and the character of material and perviousness of such strata.

The construction of the above dam, in accordance with the plans submitted, is approved, subject to the above requirements, in so far as the matter involves the jurisdiction conferred upon this office by Chapter LXV of the Consolidated Laws and Chapter 647,Laws of 1911, Section 22, as amended, and permission is given for the construction of this work up to November 1, 1924; and subject before commencement of the construction to the approval of the Water Control Commission of Water Supply Application 283, in accordance with the provisions of Article IX of the Conservation Law.

DEC

This approval shall not be deemed to authorize any invasion of property rights, either public or private in carrying out the above work; nor to create any claim against the State of New York; nor to be considered as authorizing the flooding or the use of State lands, nor as acquiescing in the flooding or use of such lands.

We enclose shipping tag No. 33 in order that you may ship to our laboratory for testing 1/2 cubic foot, exclusive of any stones over 1/4 inch in size mixed therewith, of the sand to be used for the concrete in the above dam.

Please acknowledge the receipt of this letter and advise us when the work is started.

Very truly yours,

Deputy State Engineer.

Enclosure.

Copy to-

Fuller & McClintock,
170 Broadway,
New York City.

Water Control Commission

DEC

DWIGHT B. LA DU
STATE ENGINEER

ARNOLD G. CHAPMAN
DEPUTY

STATE OF NEW YORK
STATE ENGINEER AND SURVEYOR
ALBANY

Testing Laboratory
State Engineer's Dep't
Albany, N. Y.

ADDRESS ALL COMMUNICATIONS TO
DWIGHT B. LA DU, STATE ENGINEER

Sept. 7, 1923.

Hon. Dwight B. La Du,
State Engineer and Surveyor,
Albany, N. Y.

Dear Sir:-

Enclosed you will please find the report of results of tests of a sample of sand received from the City of Newburgh and proposed for use on a dam on the Silver Stream.

These results show a well-graded fine sand and indicate that this sand should be satisfactory for use in concrete if used in proper proportions with other materials.

Yours very truly,

Russell S. Greenman

Sen. Asst. Engineer,
in charge of Tests.

DEC

F3-48

September 10, 1923.

Dam 531,L.Hudson,
Newburgh.

Mr. James C. Harding,
170 Broadway,
New York City.

Dear Sir:

We have tested the sample, No. 36, of sand received by our laboratory on August 20, and submitted for use in the concrete of dam No. 533, Lower Hudson,Newburgh, for the Silver Stream Reservoir.

The results of the test show a well graded, fine sand and indicate that this sand should be satisfactory in the concrete if used in the proper proportions with cement and coarse aggregate. The percentage of voids was 26.7 and the tests for strength were made with a mixture by bulk of 2-1/2 of sand to 1 of cement.

Very truly yours,

Deputy State Engineer.

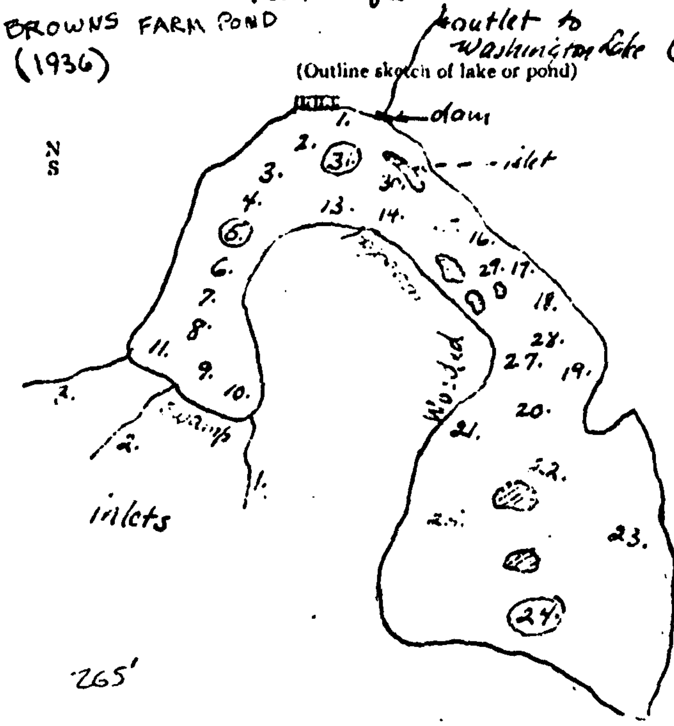
ARMcK/F.

DEC

F3-49

[illegible] surface - 80°
air - 85°

BROWNS FARM POND
(1936)



(Outline sketch of lake or pond)

1- 13'-78°
2- 13'- 77°
3- 12'- 73°
4- 10'- 73°
(5)- 11'- 74°
6- 11'- 73°
7- 10'- 74°
8- 10'- 74°
9- 10'- 74°
10- 6'- 75°
11- 5'- 76°
12- 13'- 75°
13- 14'- 75°
14- 15'- 75°
15- 13'- 75°
16- 8'- 75°
17- 11'- 75°
18- 10'- 76°
19- 11'- 75°
20- 12'- 73°
21- 12'- 74°
22- 12'- 75°
23- 10'- 75°
(24)- 10'- 75°
25- 11'- 75°
26- 12'- [illegible]
27- 13'- 75°
28- 14'- 75°
29- 14'- [illegible]
30- 10'- 76°
(31)- 13'- 75°

(Indicate principal weed beds, type of bottom and points where soundings were taken on sketch; also indicate, by numbers, points where collections were taken)

Area 265 ± acres Elevation 380'

If posted: Owner's name and address

Bottom: clay, gravel (80), marl, muck (20), rock, sand (underline; give % of each type)

Vegetation: scant, fair, abundant, floating (95), submerged (5) (underline; give % of each type)

Source: springs in bottom, ~~spring streams~~, surface water (underline)

Shore line: wooded, swampy, cultivated + open

Color of water: white, light brown, brown [illegible]

Height of dam if present 2(?) 15'

Accessibility: road, trail, portage

Req. 197. FORM 630. 5-8-36-10,000

Coll. no. WCS # 20

Drainage Hudson River Browns Pond Farm-1-P225-2

Locality P226A Browns River
89- Hudson River

Elevation 380'

County Orange Quadrangle Schunemunk Width

Water TW Flow

Vegetation Scant Current

Bottom mk gr Distance from shore 200'. 500' & 0-20'

Shore Open Time 2.45 PM Weather Clear

Temperature: Air 85° Water S. 80° B. 73° Depth of water 14'

Depth of capture 8'-13' + 0-4'

Method of capture 5/8"-1¼" bar gill nets (day & night set) + 15' seine

Collected by Senning & Bourque Date 7/9-10/36

Orig. preserv. 10% formalin Time Immediately

General notes: History of stocking and angling; fishing conditions and size of fish, etc. No bluegill with [illegible]

NYSDEC BUREAU OF FISH & WILDLIFE

F3-50

Silver Spring Rds.

DAM INSPECTION REPORT
(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class*	Date & Inspector
531	L. Hudson	Wallkill	Orange	C	9/18/74 KNH

Type of Construction

- [x] Earth w/concrete spillway
- [ ] Earth w/drop inlet pipe
- [ ] Earth w/stone or riprap spillway
- [ ] Concrete
- [ ] Stone
- [ ] Timber

Use

- [x] Water Supply
- [ ] Power
- [x] Recreation
- [ ] Fish and Wildlife
- [ ] Farm Pond
- [ ] No Apparent Use-Abandoned

Estimated Impoundment Size

- [ ] 1-5 acres
- [ ] 5-10 acres
- [x] Over 10 acres

Estimated Height of Dam above Streambed

- [ ] Under 10 feet
- [x] 10-25 feet
- [ ] Over 25 feet

Condition of Spillway

- [x] Service satisfactory
- [ ] In need of repair or maintenance
- [x] Auxiliary satisfactory
- [ ] In need of repair or maintenance

Explain: _____

Condition of Non-Overflow Section

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

some leakage thru. concrete wall - fixed

Condition of Mechanical Equipment

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

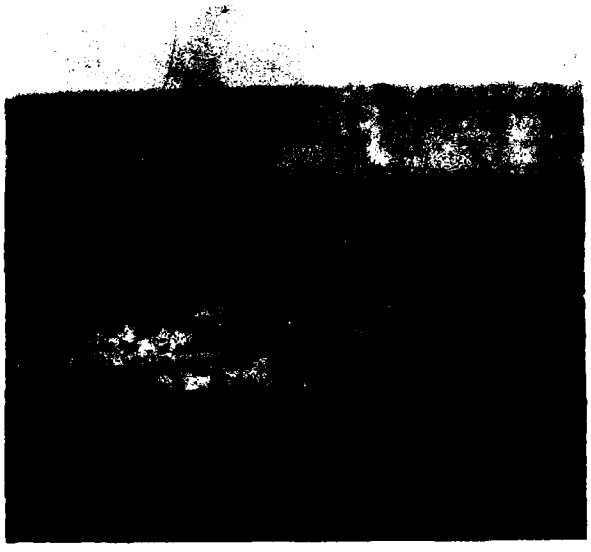
Evaluation (From Visual Inspection)

- [x] No defects observed beyond normal maintenance
- [ ] Repairs required beyond normal maintenance

*Explain Hazard Class, if Necessary _____

DEC

1974

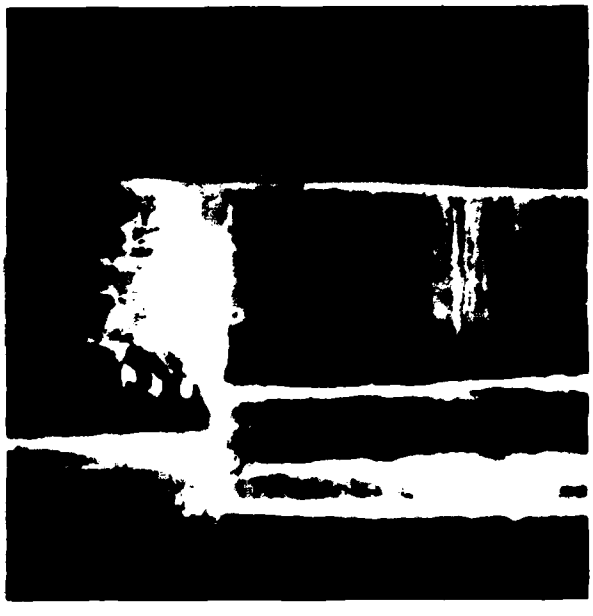


A

B

Selected photos of West Dam (Dike) before repairing cracks - Summer 1978

C



D

Selected photos of West Dam (Dike) after repairing cracks - Fall 1978

APPENDIX G

DRAWINGS

TABLE OF CONTENTS

CITY OF NEWBURG

CONTRACT DRAWINGS

SILVER STREAM

July, 1922

CITY MANAGER

W JOHNSTON McKAY

MAYOR

HENRY M. LEONARD

CITY COUNCIL

W R. PERKINS
W D FOWLER
F J HILTON
J W. BRUNDAGE

NEWBURGH, N. Y.

DRAWINGS FOR

STREAM DAM

...BER, 1922

MAYOR

...NRY M. LEONARD

...ITY COUNCIL

...W. R. PERKINS
...A. D. FOWLER
...F. J. HILTON
...W. BRUNDAGE

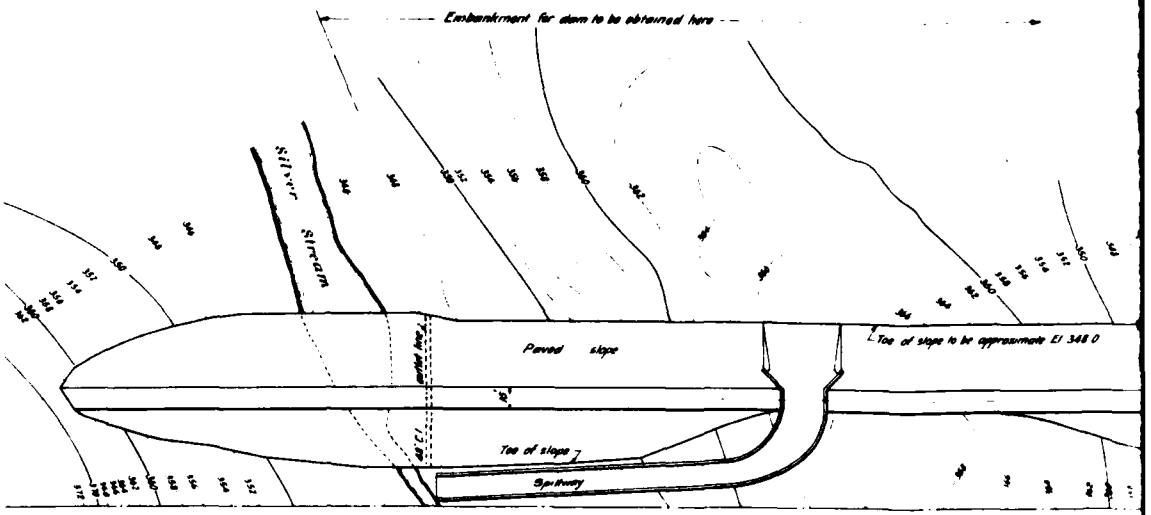
ENGINEERS

GEORGE W. FULLER
JAMES C. HARDING

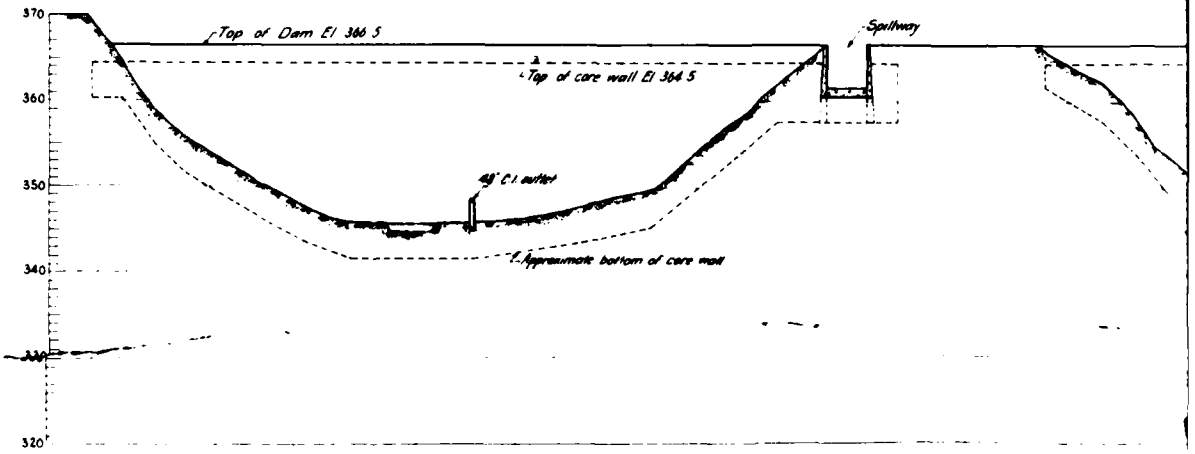
G-1

CTM DWG NO. 81-17

2



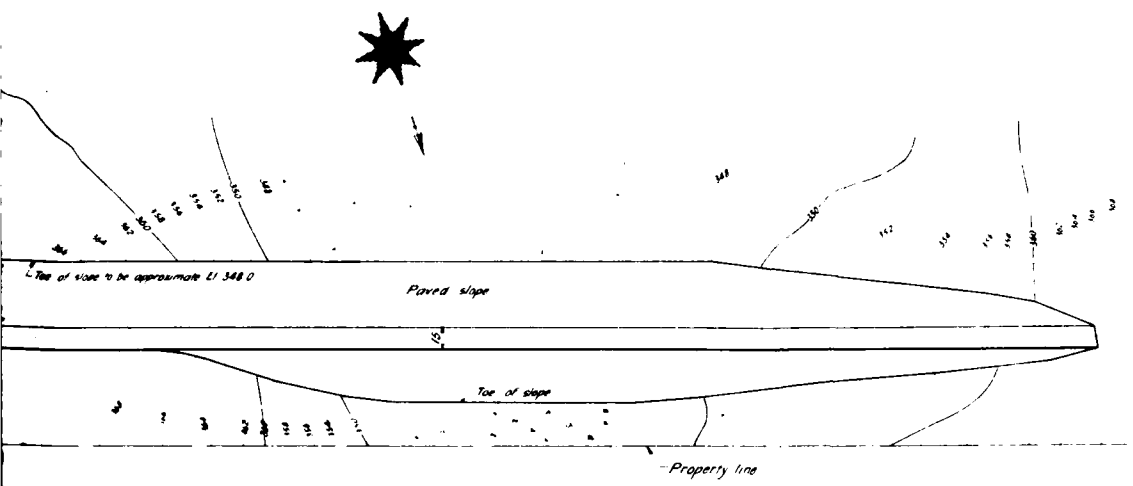
PLAN



PROFILE

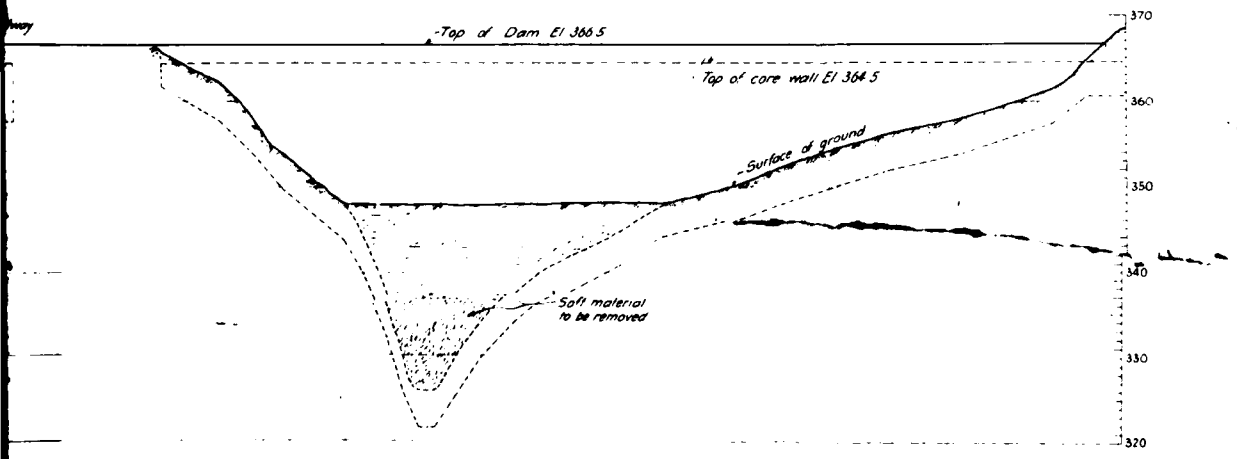
FULLER & McCLINTOCK
170 BROADWAY
NEW YORK

FROM OWNER
REDUCED TO 50% OF ORIGINAL



PLAN

WEST HALF NOT BUILT



PROFILE

NEWBURGH, N.Y.

SILVER STREAM DAM

GENERAL PLAN

SCALES: HOR 1"=60'
VER 1"=10'

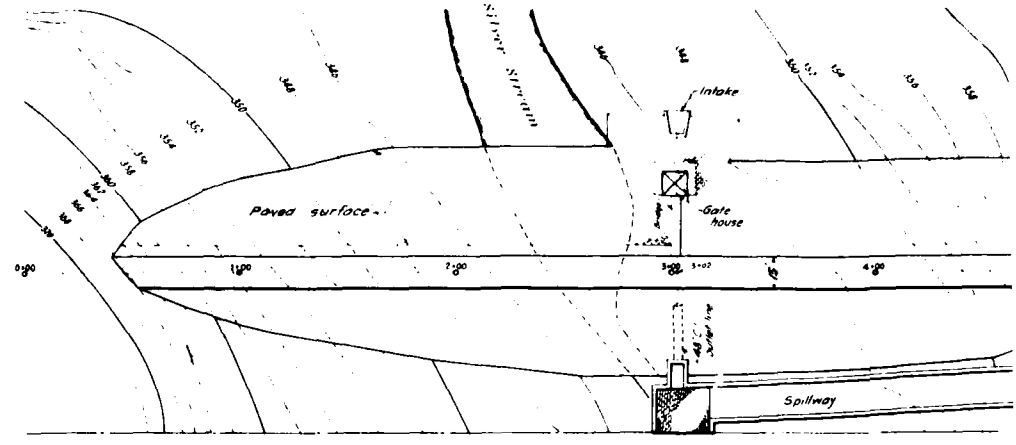
JULY, 1922

James Lefferling

SHEET 1 OF 8

G-2

CTM DWG NO. 81-17



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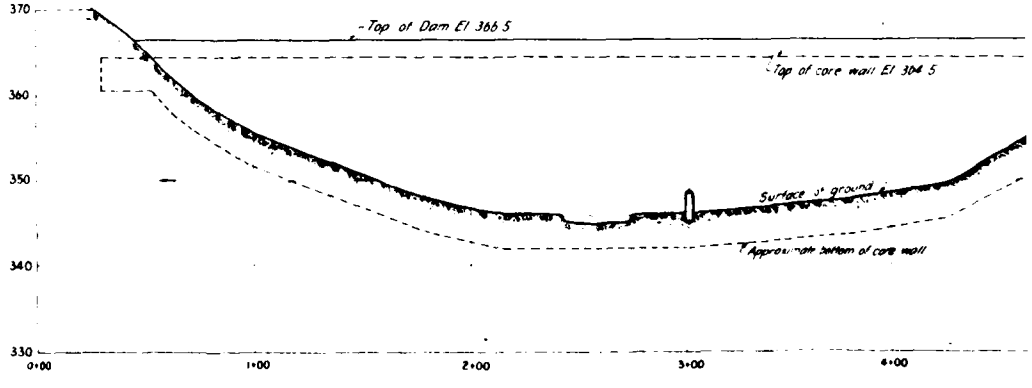
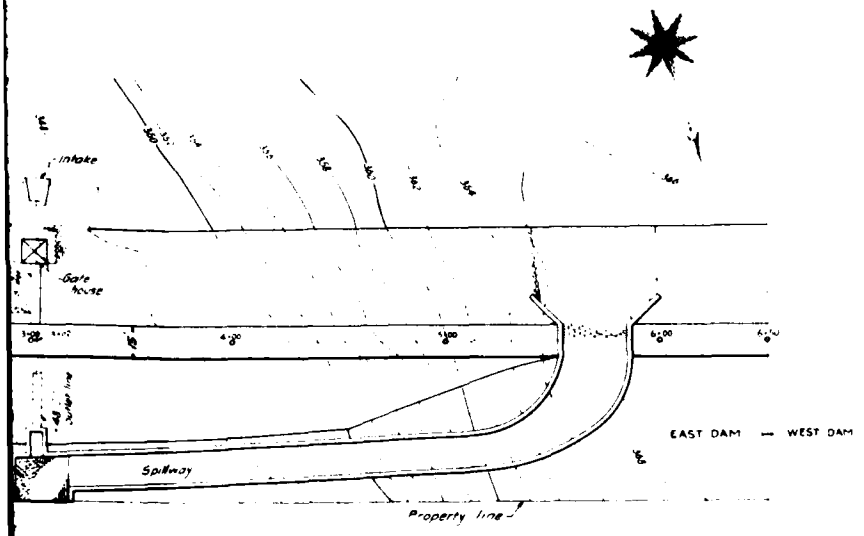


PROFILE

FULLER & McCLINTOCK
170 BROADWAY
NEW YORK



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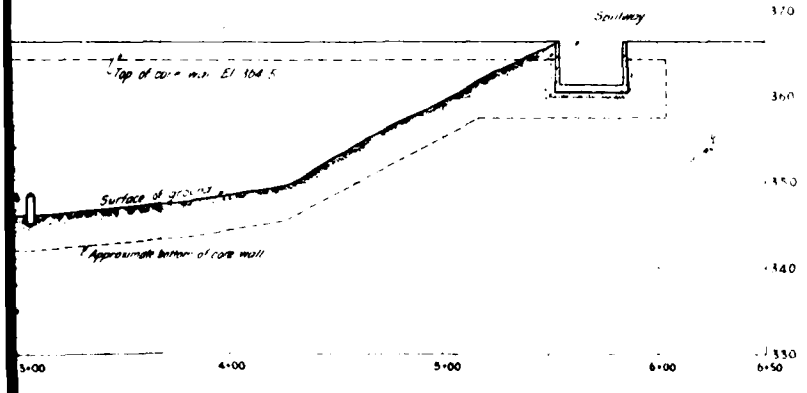


PROFILE

NEWBURGH, N Y.

SILVER STREAM DAM

EAST DAM

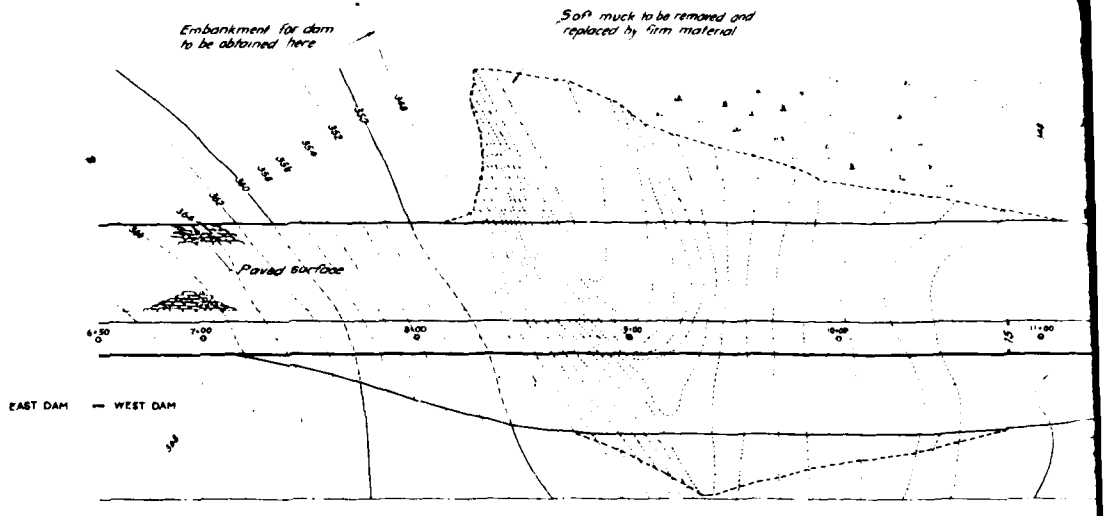
SCALES: HOR 1"=40'
VER 1"=10'

JULY, 1922

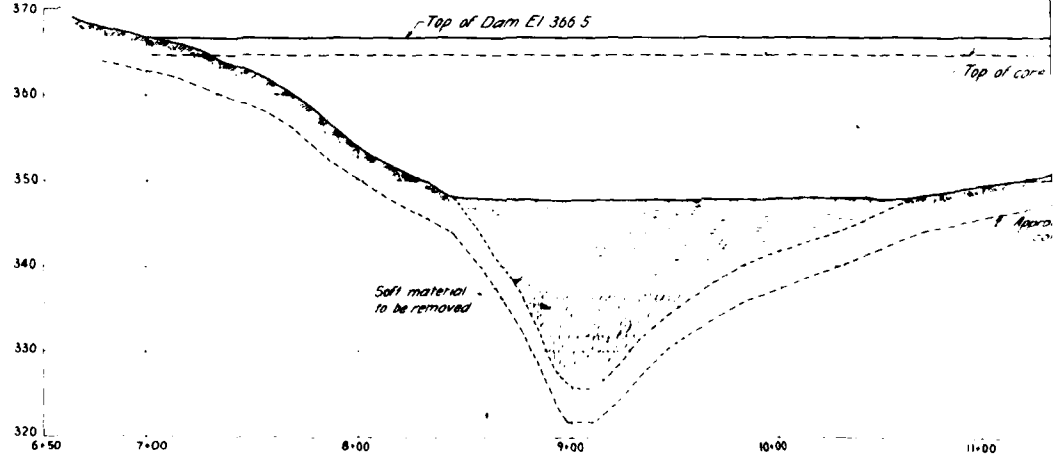
SHEET 2 OF 8

G-3

CTM DWG NO. 81-17 2



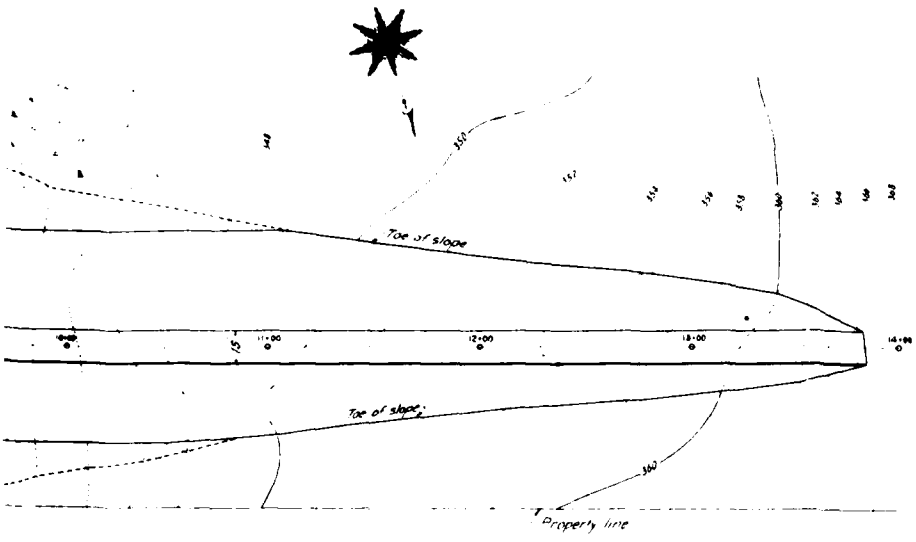
PLAN



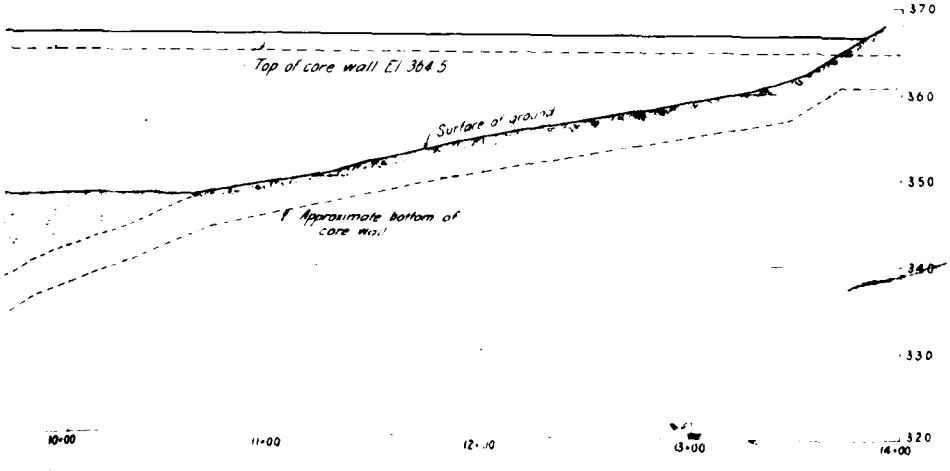
PROFILE

FULLER & MCCLINTOCK
70 BROADWAY
NEW YORK

FROM OWNER
REDUCED TO 50% OF ORIGINAL



PLAN



PROFILE

NOT BUILT

NEWBURGH, N.Y.

SILVER STREAM DAM

WEST DAM - ALTERNATE "A"

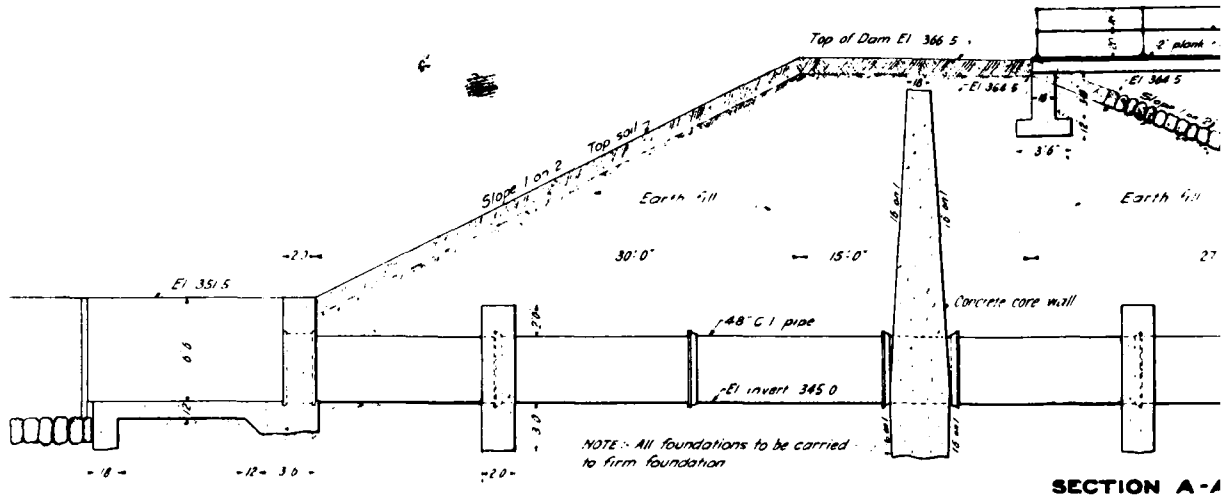
SCALES HOR 1" = 40'
VER 1" = 10'

JULY, 1922

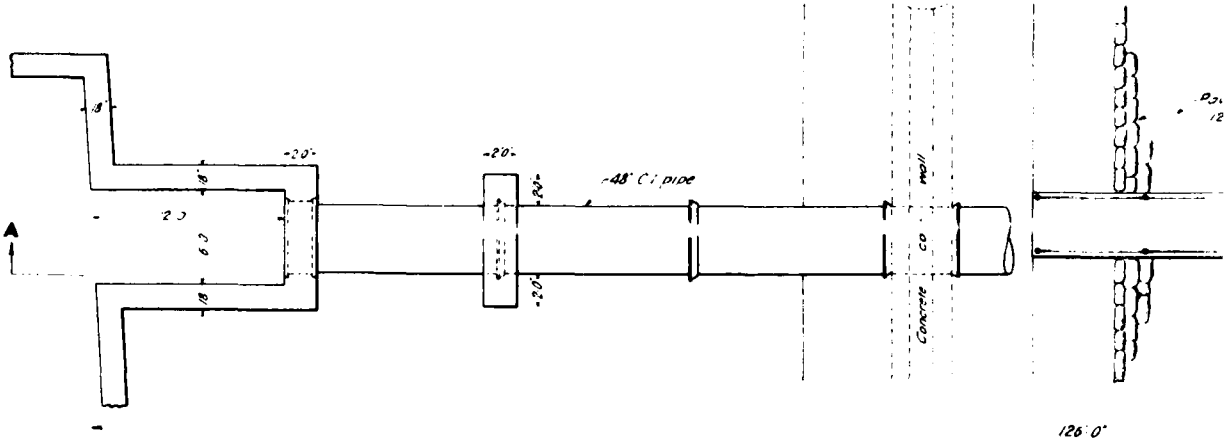
SHEET 3 OF 8

G-4

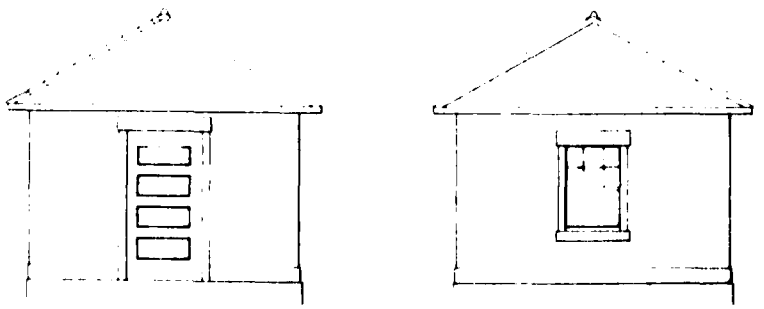
CTM DWG NO. 81-17 2



SECTION A-A

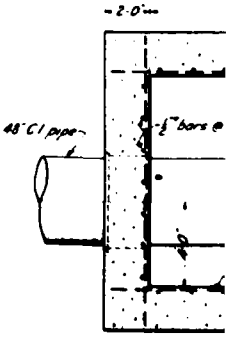


PLAN



ELEVATIONS OF GATE HOUSE

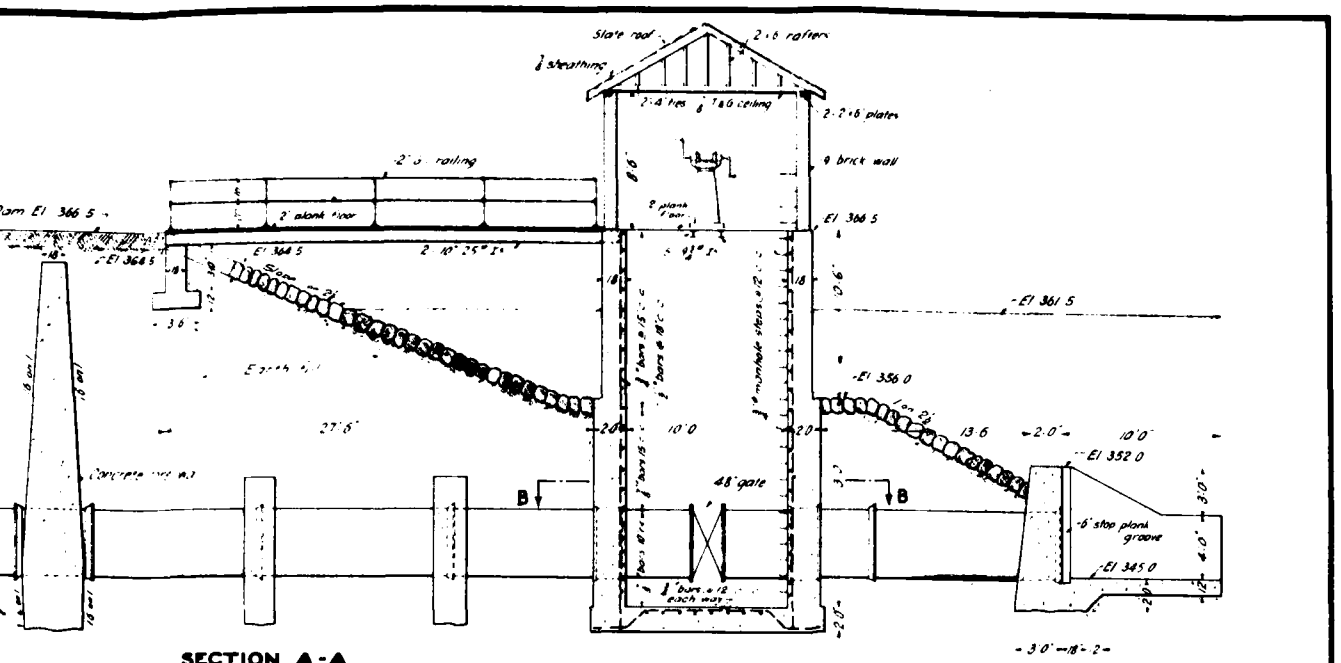
SCALE ¼" = 1'0"



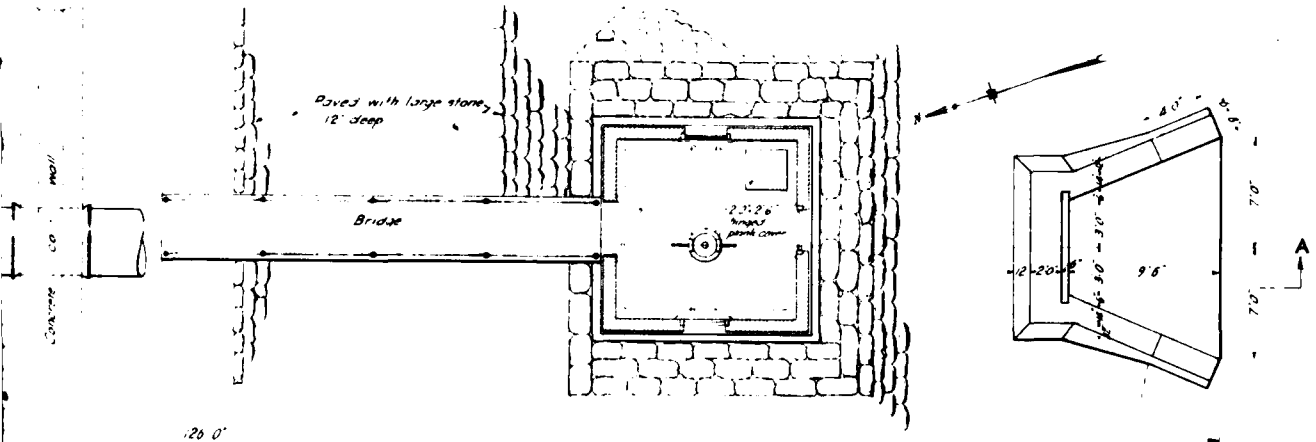
SECT

SC

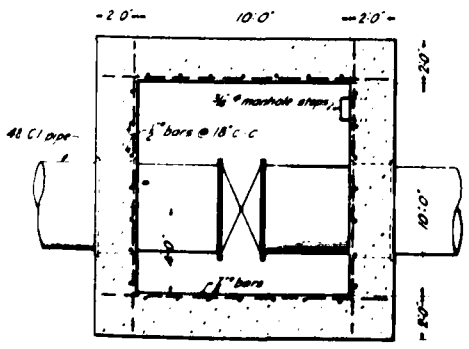
FULLER & McCLINTOCK
170 BROADWAY
NEW YORK



SECTION A-A



PLAN



SECTION B-B

SCALE 1/2" = 1'-0"

Bottom of slope

NEWBURGH, N.Y.

SILVER STREAM DAM

OUTLET WORKS

SCALE 1/8" = 1'-0"

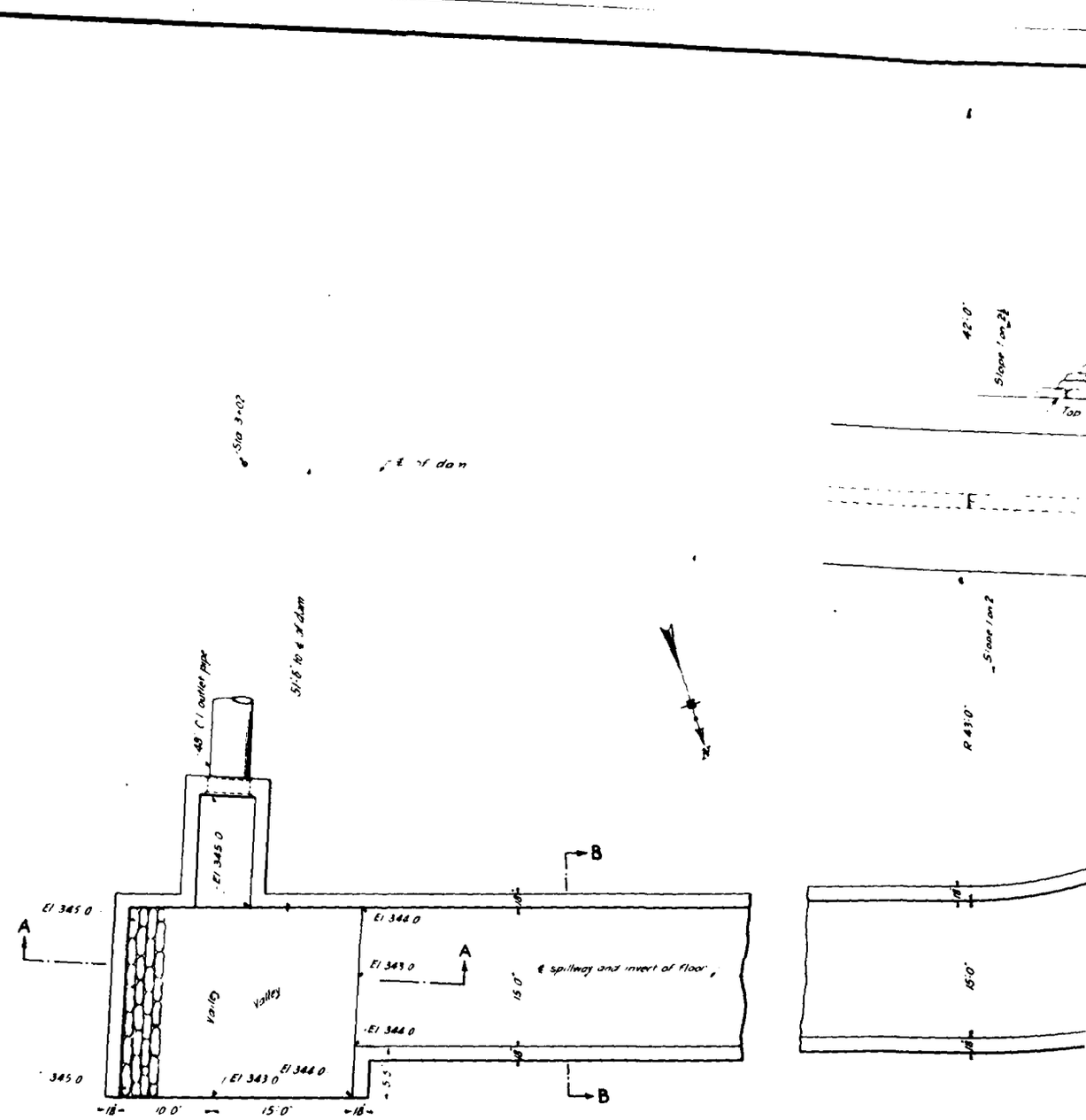
JULY, 1922

James C. Stanley

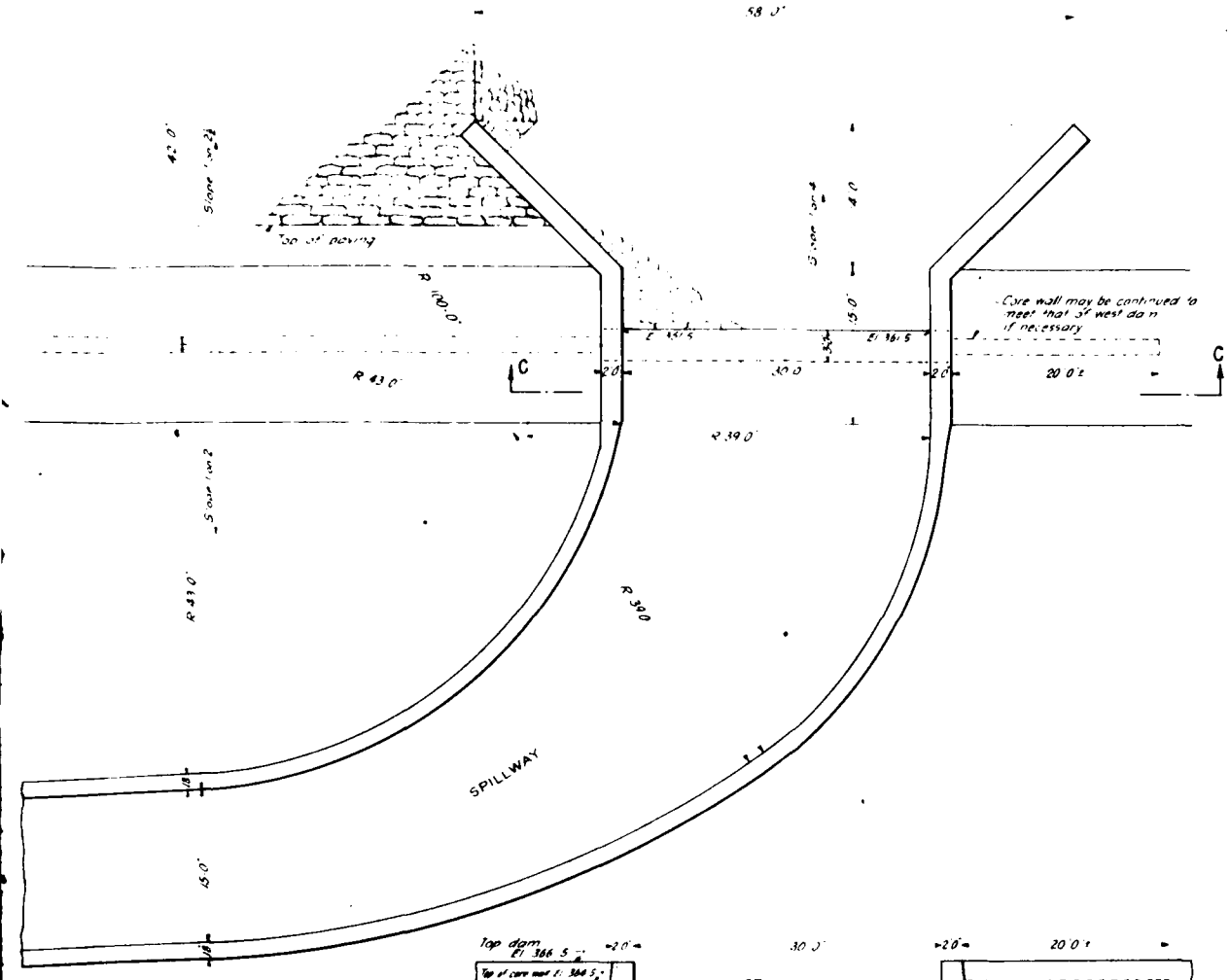
SHEET 4 OF 8

CTM DWG NO. 81-17

2



FULLER & McCLINTOCK
170 BROADWAY
NEW YORK



PLAN

SECTION C-C

B-B

NEWBURGH, N.Y.

SILVER STREAM DAM

SPILLWAY

SCALE 1/8" = 1'-0"

JULY, 1922

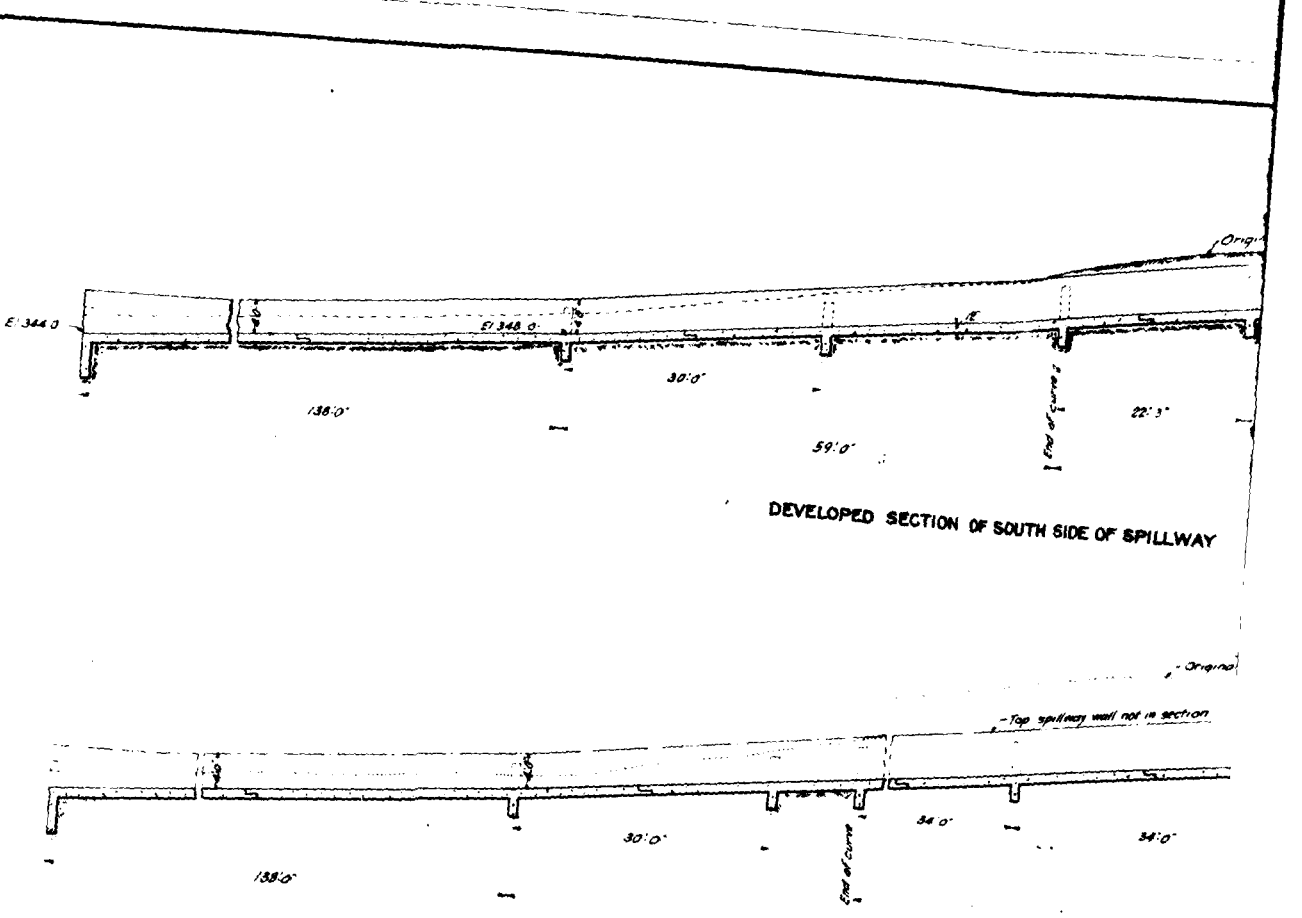
James Stirling

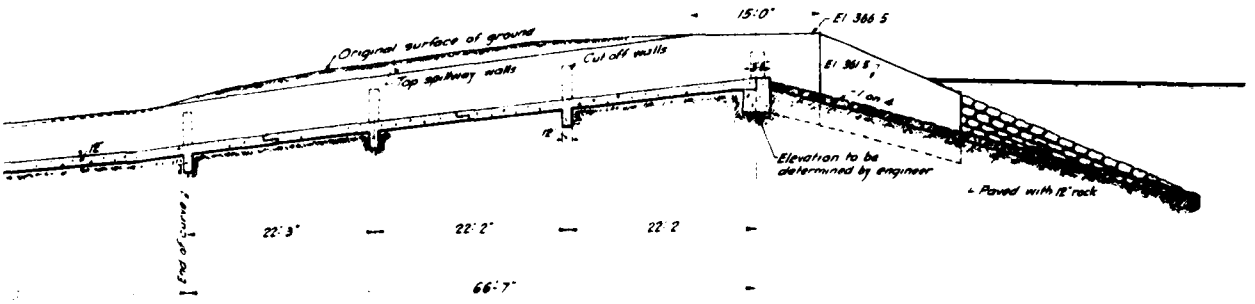
SHEET 5 OF 8

G-6

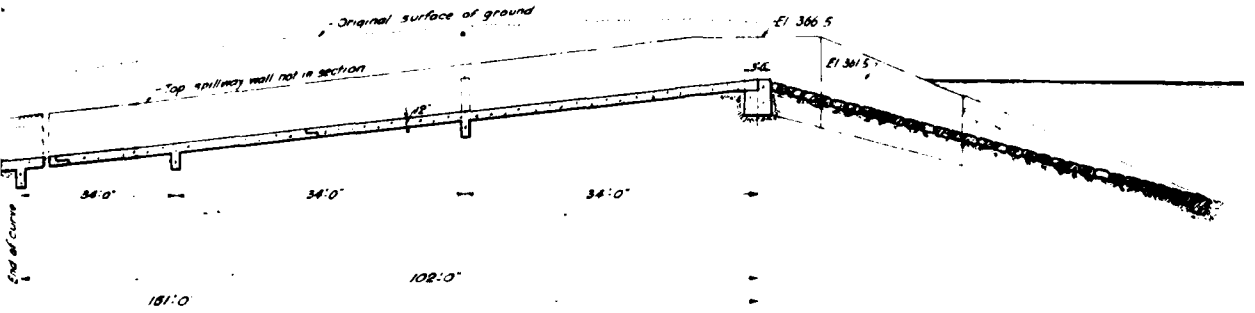
CTM DWG NO. 81-17

2

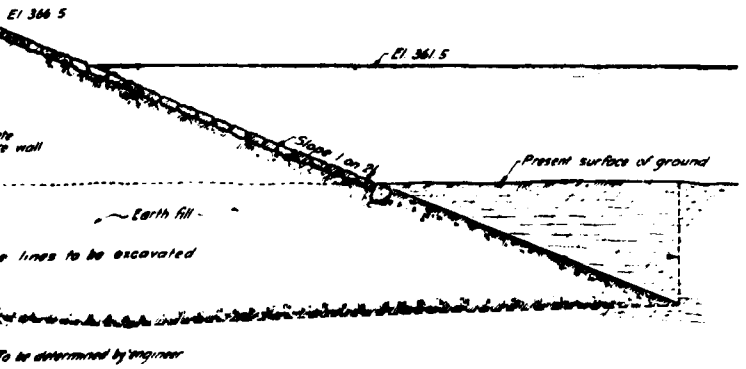

El 344.0
El 348.0
30'0"
138'0"
59'0"
End of curve
22'3"
Original
DEVELOPED SECTION OF SOUTH SIDE OF SPILLWAY
Original
Top spillway wall not in section
30'0"
138'0"
End of curve
34'0"
34'0"
181'0"
DEVELOPED SECTION OF NORTH SIDE OF SPILLWAY
15'0"
El 366 5
18"
El 364 5
Top soil
Slope 1 on 2
N Y City property
Post
Earth fill
Concrete core wall
Slope 1 on 2
Earth fill
Soft material between
these lines to be excavated
Approximate surface of firm material
To be determined by engineer
FULLER & McCLINTOCK
170 BROADWAY
NEW YORK
TYPICAL SECTION OF DAM



D SECTION OF SOUTH SIDE OF SPILLWAY



SECTION OF NORTH SIDE OF SPILLWAY

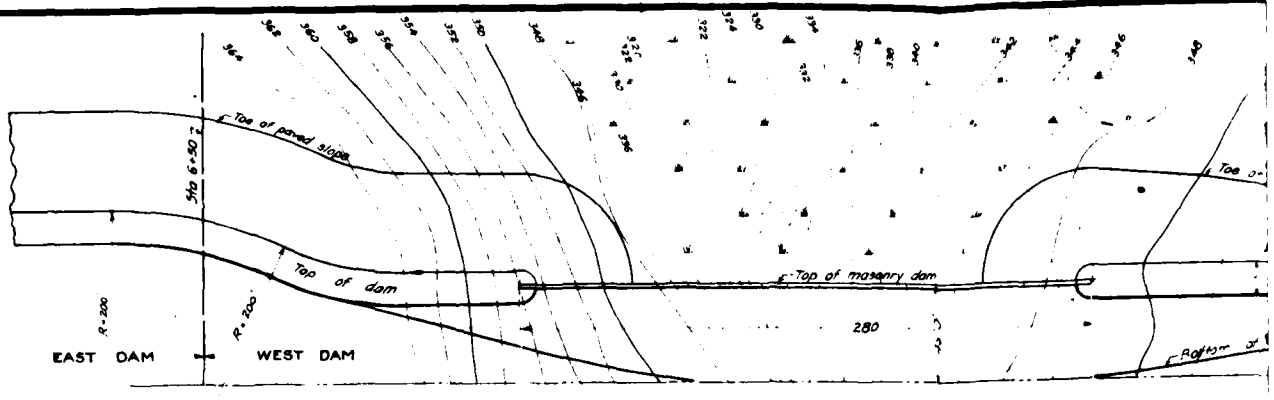


OF DAM

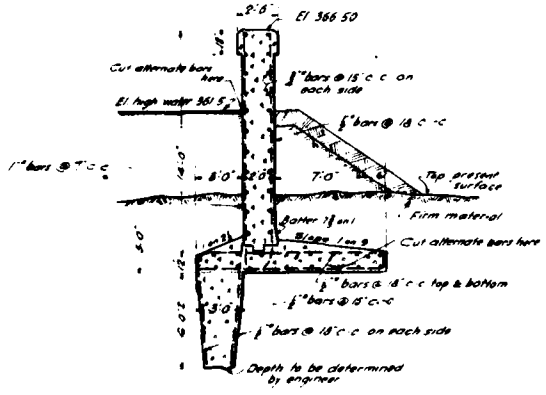
NEWBURGH, N.Y.
SILVER STREAM DAM
SECTIONS
SCALE 1"=10'0"
JULY, 1922

SHEET 6 OF 8

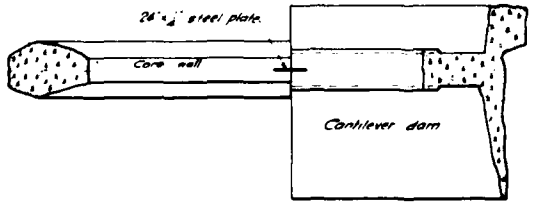
CTM DWG NO. 81-17



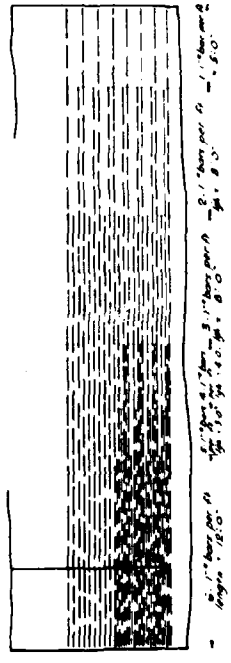
PLAN
SCALE 1"=40'-0"



MINIMUM SECTION OF DAM
SCALE 1"=1'-0"



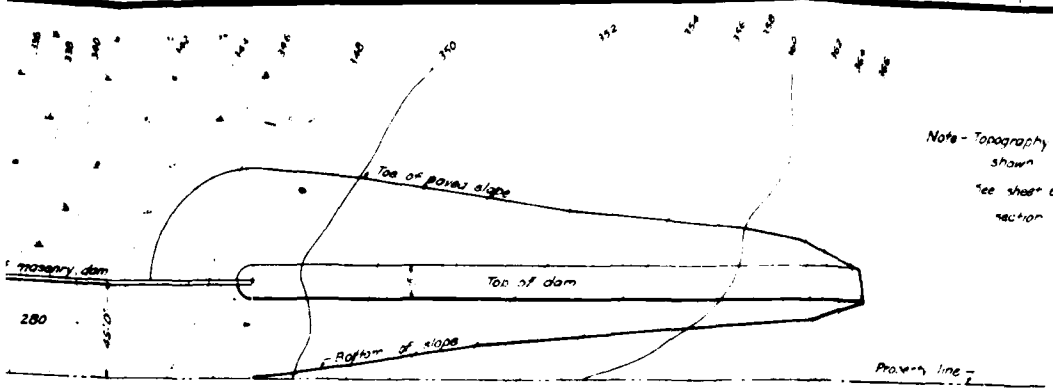
JUNCTION OF CORE WALL & CANTILEVER WALL



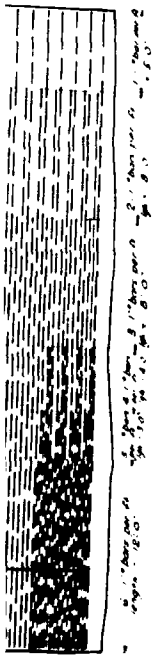
ELEVATION

FULLER & MCCLINTOCK
170 BROADWAY
NEW YORK

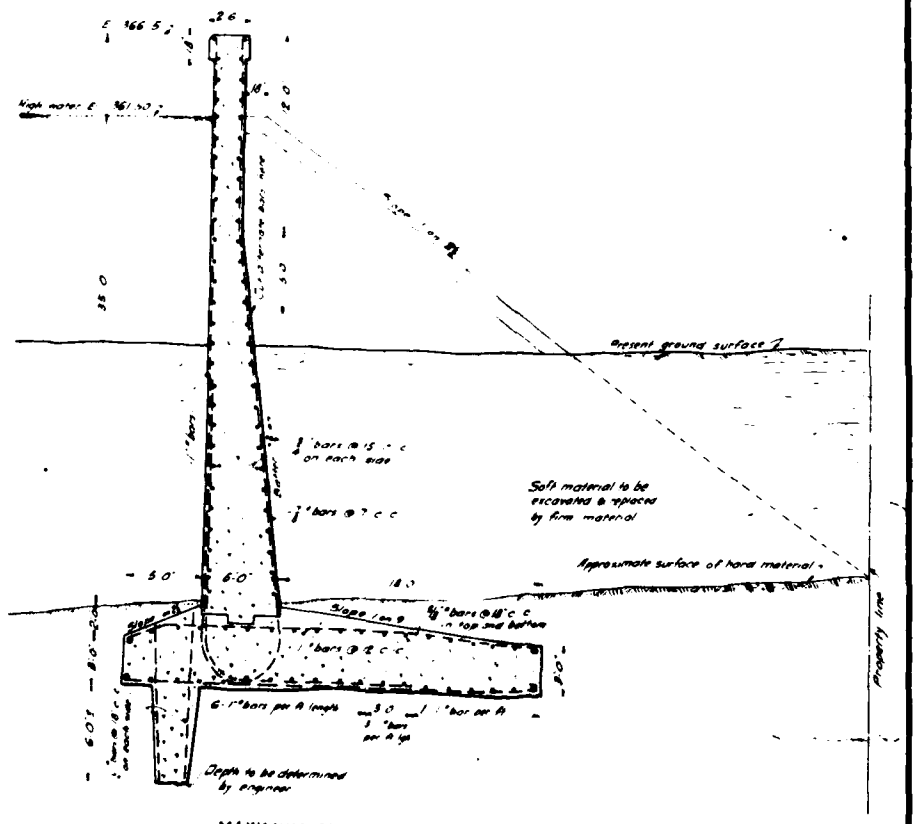
FROM OWNER
REDUCED TO 50% OF ORIGINAL



PLAN



ELEVATION



MAXIMUM SECTION OF DAM

SCALE

NOT BUILT

NEWBURGH, N.Y.

SILVER STREAM DAM

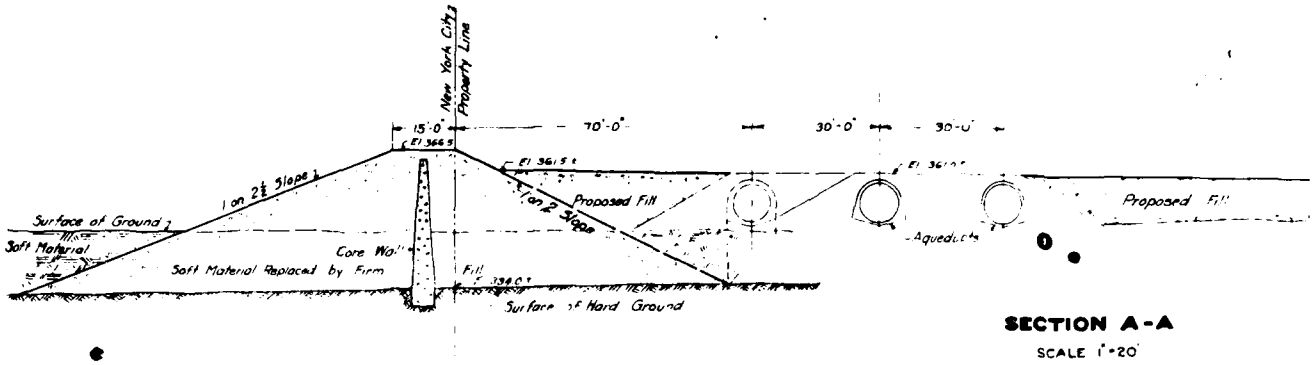
WEST DAM - ALTERNATE "B"

SCALES AS SHOWN

JULY, 1922

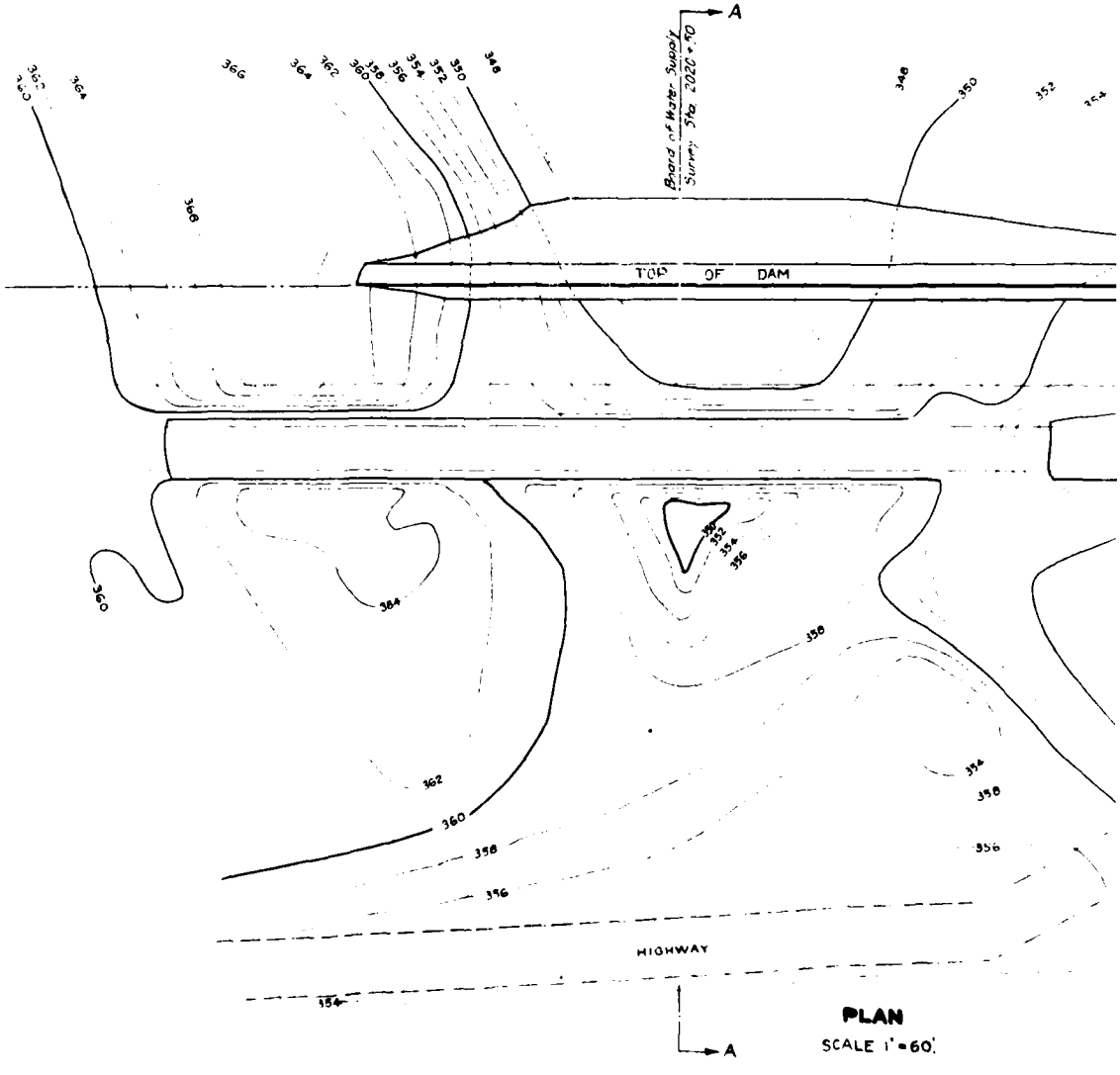
SHEET 7 OF 8

CTM DWG NO. 81-17 2



SECTION A-A

SCALE 1"=20'

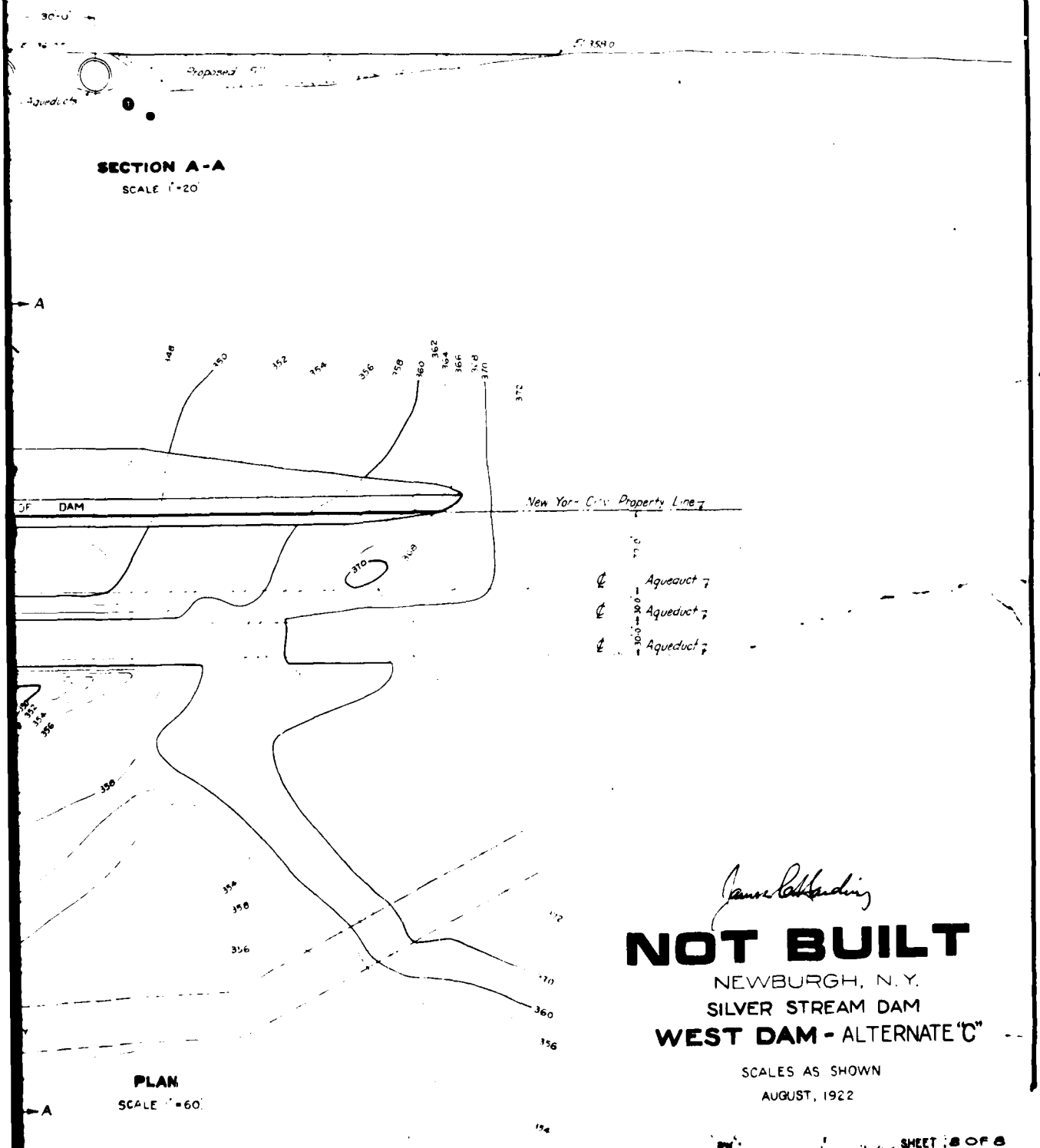


PLAN

SCALE 1"=60'

FULLER & McCLINTOCK
170 BROADWAY
NEW YORK

FROM OWNER
REDUCED TO 50% OF ORIGINAL



James Rothwell Harding

NOT BUILT

NEWBURGH, N.Y.

SILVER STREAM DAM

WEST DAM - ALTERNATE "C"

SCALES AS SHOWN

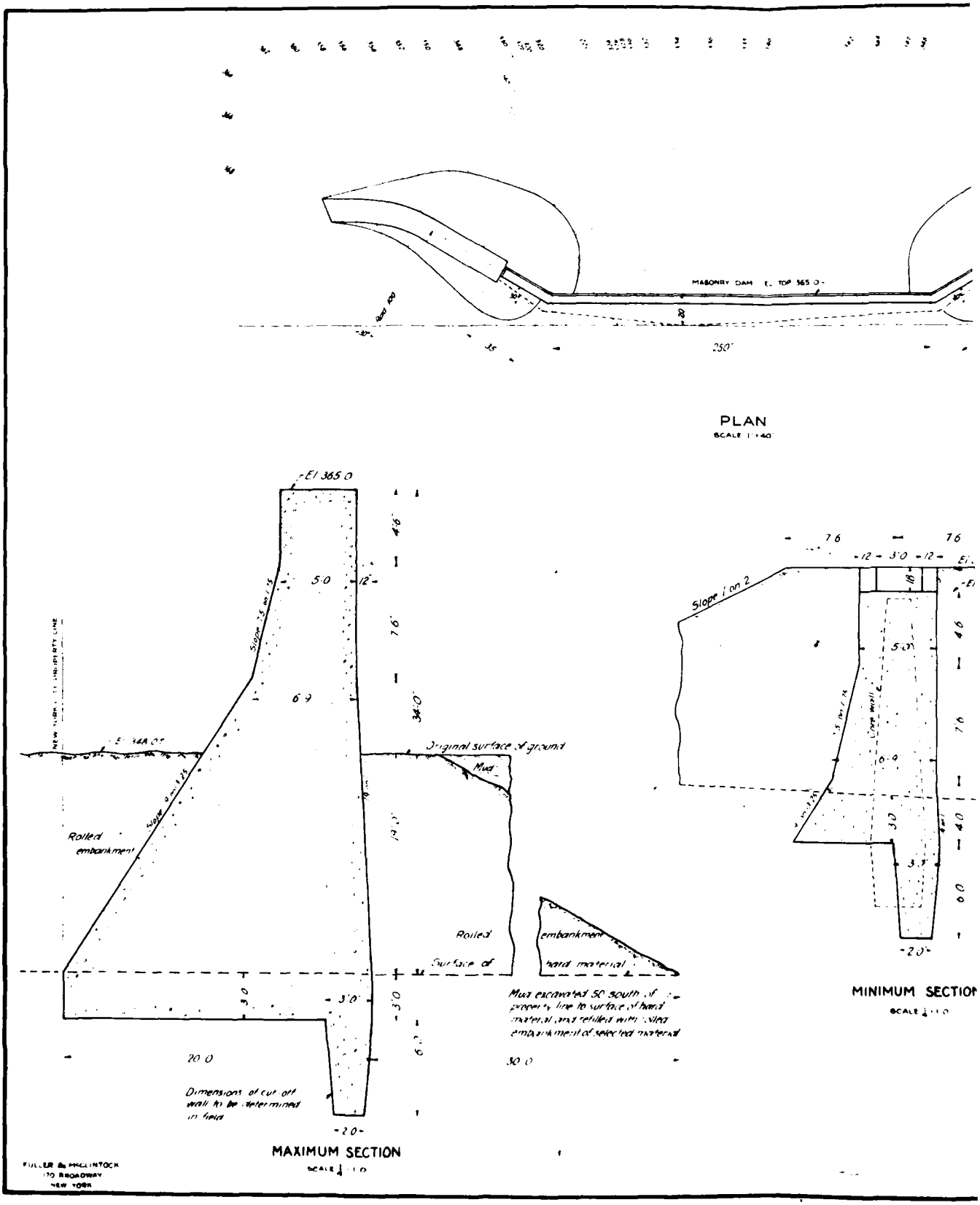
AUGUST, 1922

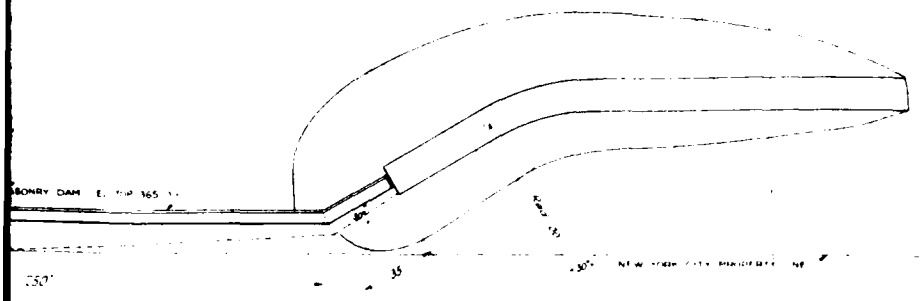
SHEET 8 OF 8

G-9

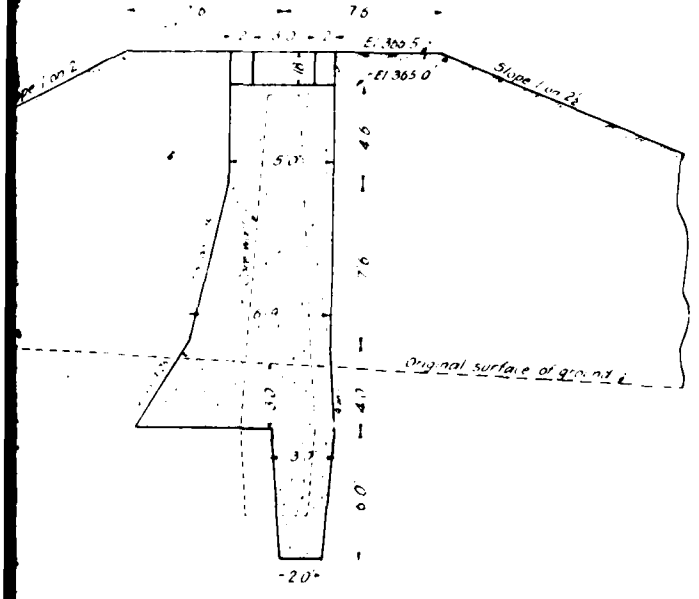
CTM DWG NO. 81-17

2

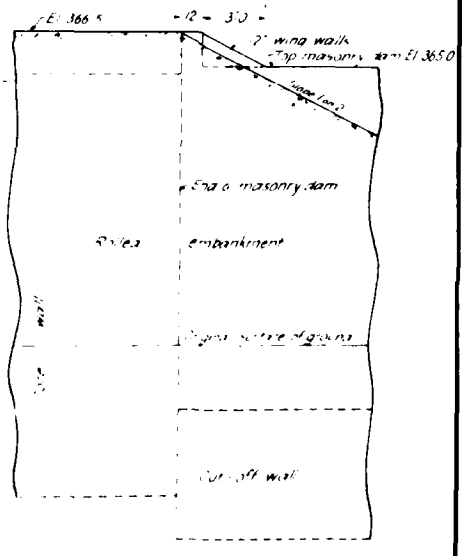




PLAN
SCALE 1" = 40'



MINIMUM SECTION
SCALE 1/4" = 1'-0"



END ELEVATION
SCALE 1/4" = 1'-0"

NEWBURGH, N.Y.
SILVER STREAM DAM
WEST DAM - ALTERNATE "D"
SCALES AS SHOWN
JUNE, 1923

James Hobbard Jr

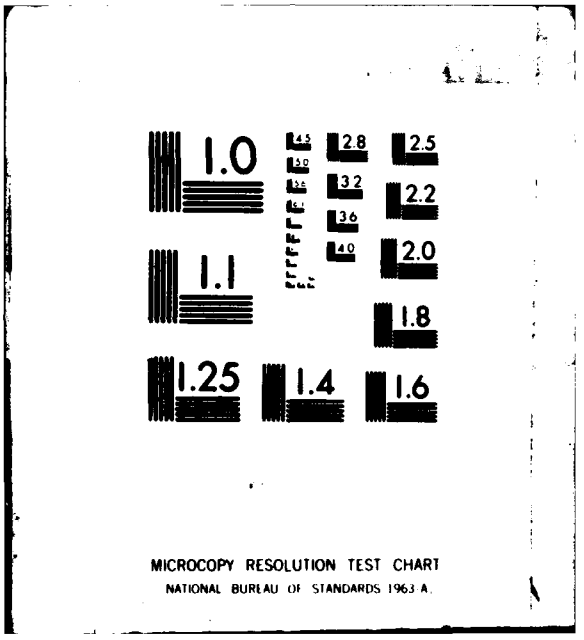
SHEET 4

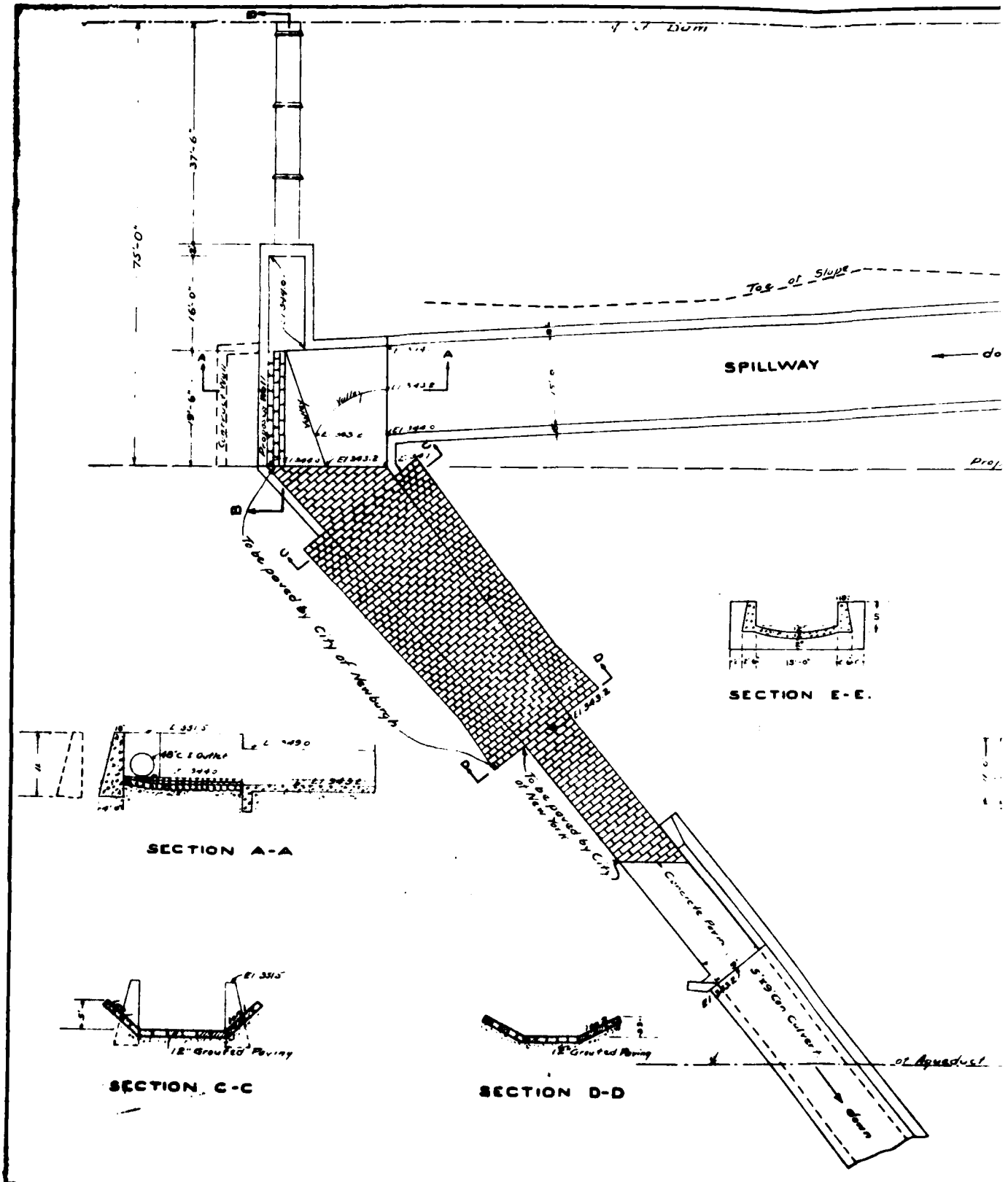
G-10

CTM DWG NO. 81-17

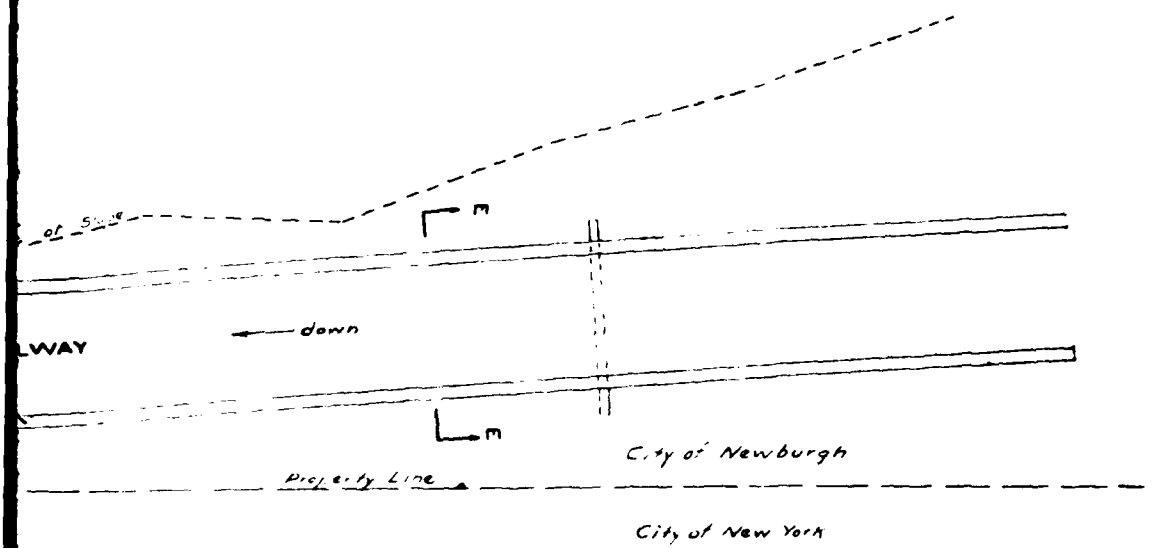
AD-A109 900 MALE (C T) ASSOCIATES SCHENECTADY NY F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. SILVER STREAM RESERVOIR DAM (I--ETC(U)
JUL 81 K J MALE DACW51-81-C-0014
UNCLASSIFIED NL

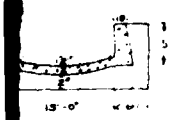
END


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

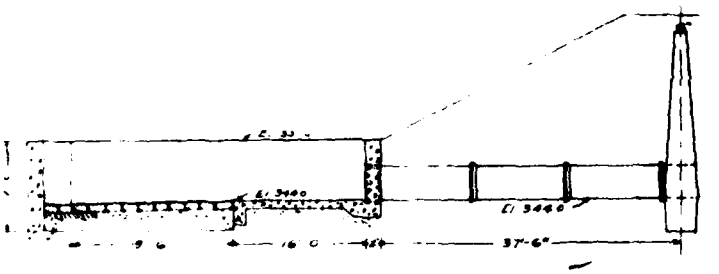


FROM OWNER
REDUCED TO 47 1/2 % OF ORIGINAL

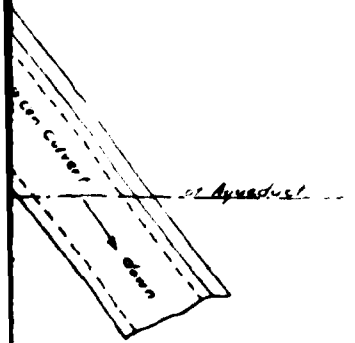




TION E-E.

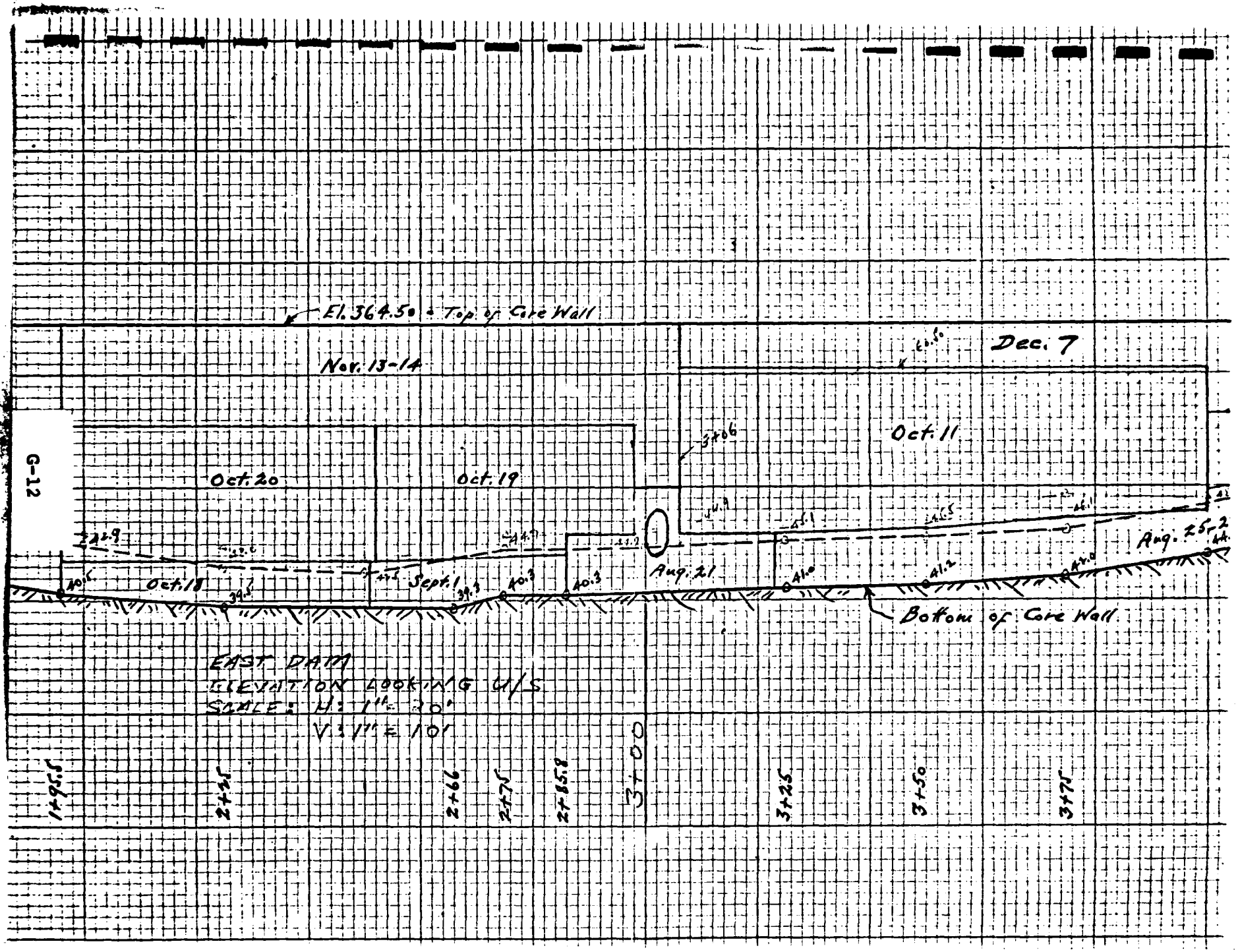


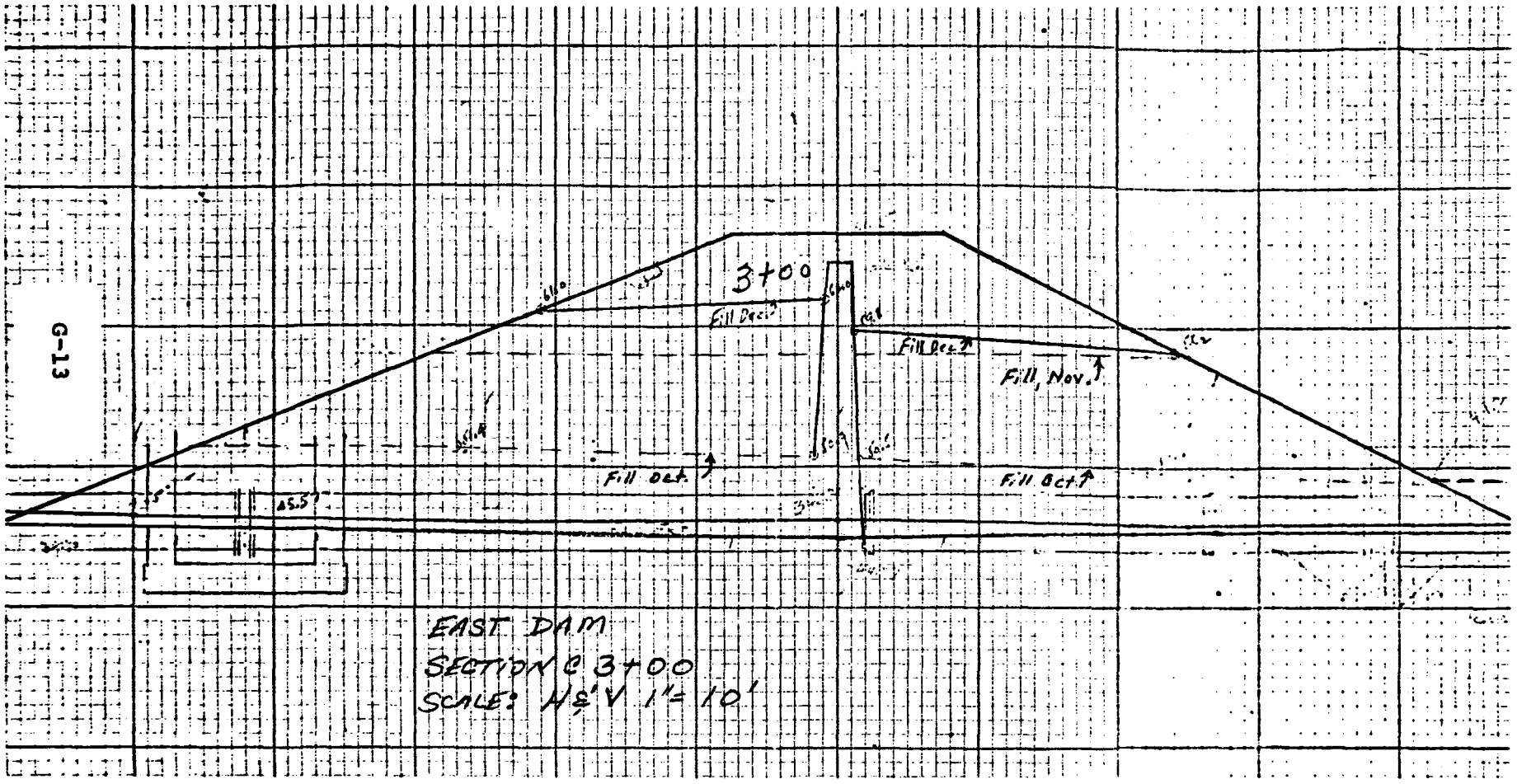
SECTION B-B

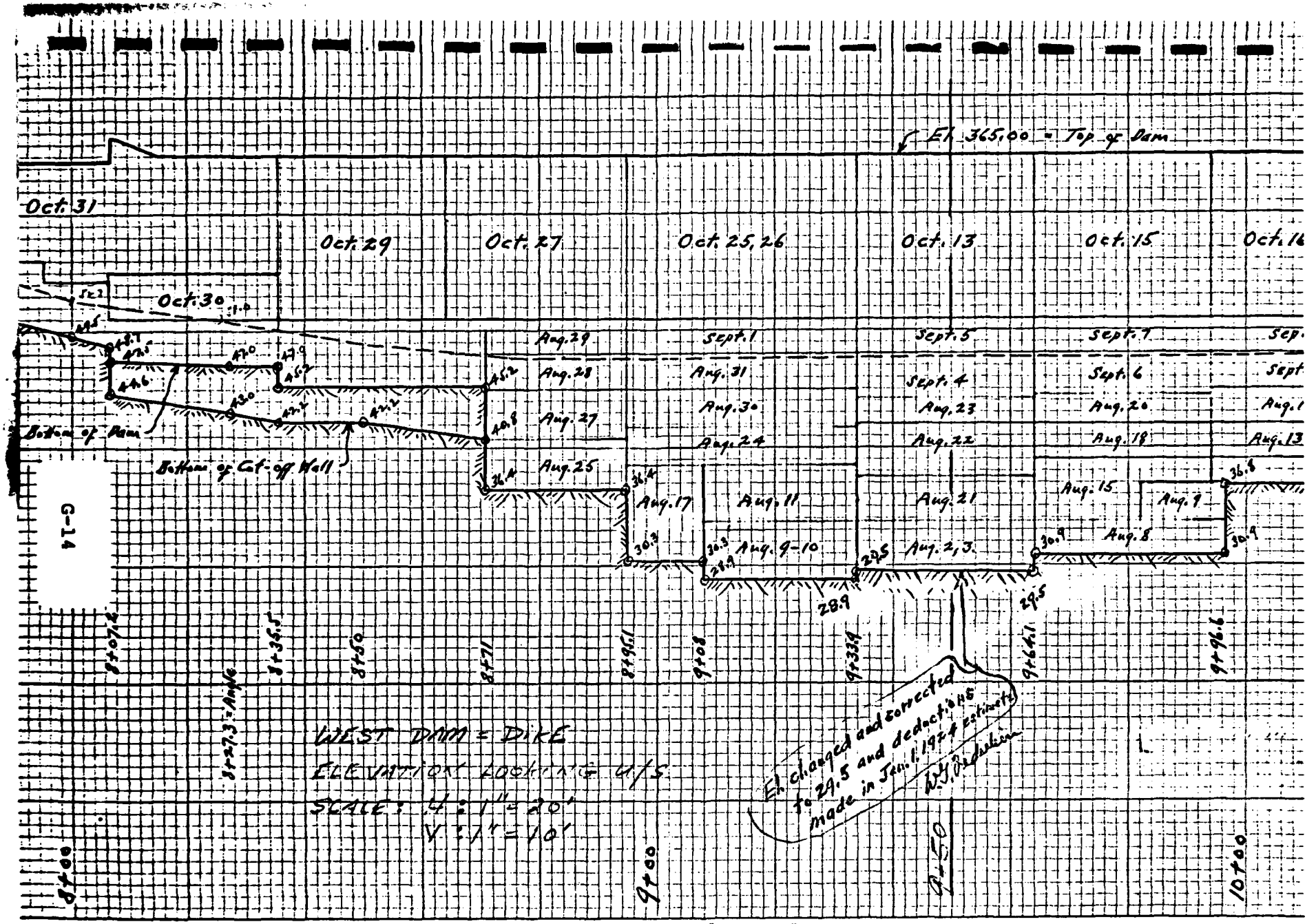


NEWBURGH N.Y.
SILVER STREAM DAM
PLAN OF PROPOSED PAVING
BETWEEN SPILLWAY & CULVERT
OVER WASHINGTON ST.
SCALE 10'=1"
JUNE 1973

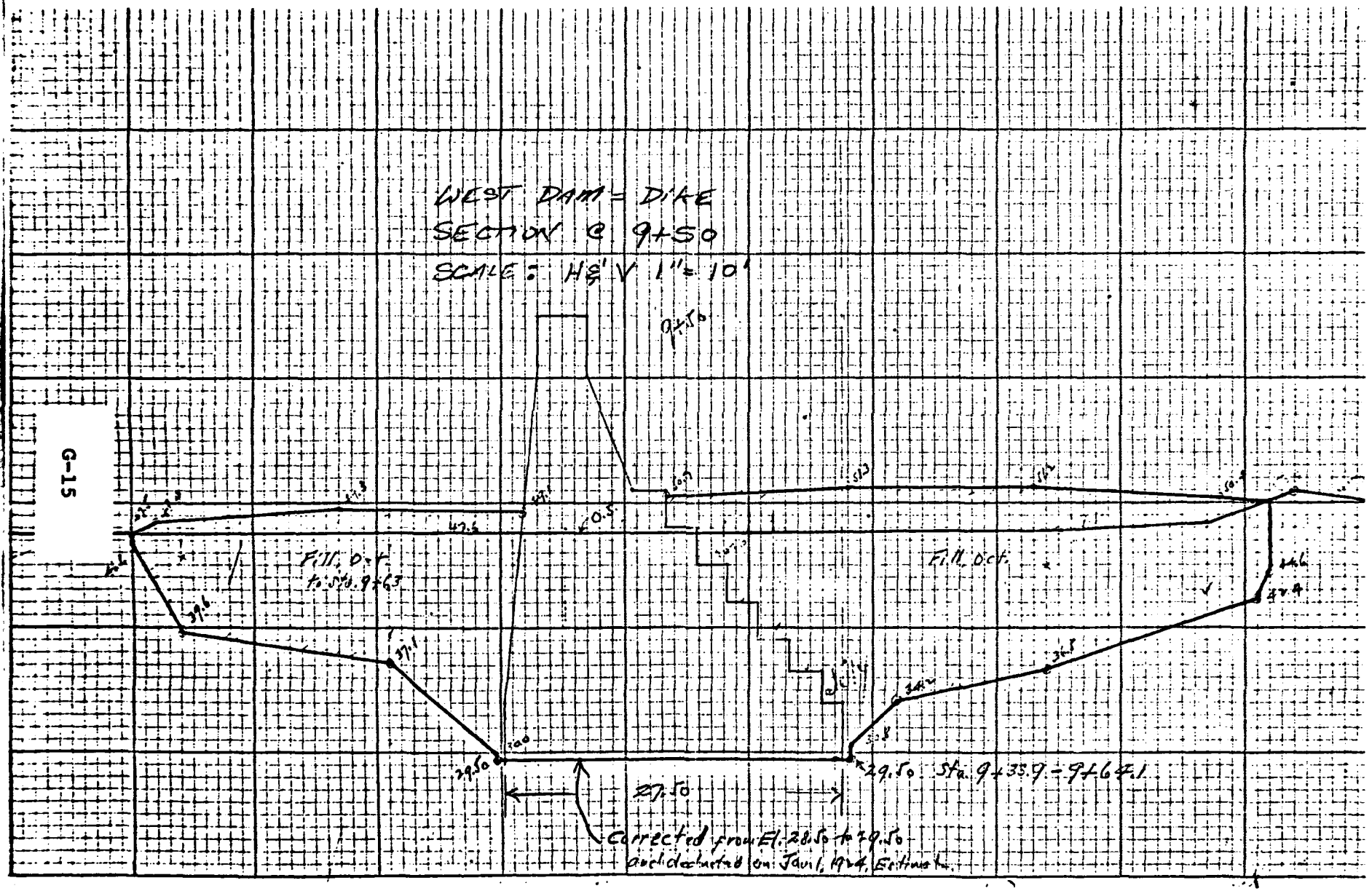
CTM DWG NO. 81-17 2


El. 364.50 ± Top of Core Wall
Nov. 13-14
Dec. 7
Oct. 11
Oct. 20
Oct. 19
Oct. 18
Sept. 1
Aug. 21
Aug. 25
Bottom of Core Wall
EAST DAM
ELEVATION LOOKING U/S
SCALE: H: 1" = 20'
V: 1" = 10'
1+95.5
2+35
2+66
2+75
2+85.8
3+00
3+25
3+50
3+75


3+00
Fill Dec.
Fill Dec.
Fill, Nov.
Fill Oct.
Fill Oct.
EAST DAM
SECTION @ 3+00
SCALE: H & V 1" = 10'



"Perfect" CROSS SECTION. 10 × 10 · 1 INCH.
EUGENE DIETZGEN Co.


WEST DAM = DIKE
SECTION @ 9+50
SCALE: H & V 1" = 10'
9+50
G-15
Fill, O.C.
to Sta. 9+63
Fill, O.C.
29.50
Sta. 9+35.9 - 9+64.1
29.50
Corrected from El. 28.50 to 29.50
and deducted on: Jan 1, 1924, Estimate